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TITLE OF THESIS ..... GRAPHIC CUES USED BY BEGINNING  
..... READERS .....

DEGREE FOR WHICH THESIS WAS PRESENTED ..... MASTER OF EDUCATION .....

YEAR THIS DEGREE GRANTED ..... 1976 .....

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GRAPHIC CUES USED BY BEGINNING READERS

by



DAVID MICHAEL EAGAN


A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE  
MASTER OF EDUCATION

DEPARTMENT OF ELEMENTARY EDUCATION

EDMONTON, ALBERTA

FALL, 1976



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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled GRAPHIC CUES USED BY BEGINNING READERS submitted by DAVID MICHAEL EAGAN in partial fulfilment of the requirements for the degree of Master of Education.





## ABSTRACT

This study investigated the use of graphic cues for word identification by beginning grade one readers. In order to obtain an indication of how beginning readers were internally processing the graphic information on the printed page, comparisons were made between the graphic cues used for word identification by three achievement groups reading words in isolation and context.

A 3 x 2 Factorial Design with repeated measures was used to make comparisons between graphic cues used in isolation and context as well as graphic cues used by high, average and low reading groups. The forty eight children were divided into the reading achievement groups on the basis of scores obtained on a standardized reading test. Selected passages from a reading inventory and word lists constructed from the reading inventory were presented to the children and their oral reading miscues were recorded.

The data were analyzed under three categories: the amount of graphic information used from the whole word; the amount of graphic information used from initial, medial and final positions in the word; and the amount of selected featural information used for word identification. The data were analyzed using two-way analysis of variance and Newman-Keuls multiple comparison tests of means.

The findings of the study indicate that beginning readers use more graphic information for word identification in isolation than in context and that this information may differ in kind as well as amount. The study also suggests that accomplished beginning





readers use more graphic information for word identification than do less able readers. Finally, it appears that the features included in this study are used by beginning readers in the internalized processing of the visual stimuli from the printed page.

The findings have implications for both reading theory and the teaching of reading.



## ACKNOWLEDGEMENTS

The author wishes to acknowledge the assistance of the following people:

Dr. Grace Malicky, the supervisor of the study, for her suggestions during the initial stages, her expeditious reading of the preliminary drafts and her constructive criticism.

Dr. W.D. Wilde and Dr. B. Blowers, for their participation on the thesis examining committee.

Sister Ruth Eagan, for her encouragement and assistance in coding the data.

Joan Zowtuk, for her typing of the manuscript on very short notice.

Sharon and the children, for making it an enjoyable year.





## TABLE OF CONTENTS

	Page
LIST OF TABLES .....	xii
LIST OF FIGURES .....	xiii
Chapter	
1 THE PROBLEM .....	1
INTRODUCTION AND STATEMENT OF THE PROBLEM .....	1
PURPOSE OF THE STUDY .....	2
HYPOTHESES .....	3
DEFINITION OF TERMS .....	5
SIGNIFICANCE OF THE STUDY .....	6
LIMITATIONS AND DELIMITATIONS .....	7
PLAN OF THE INVESTIGATION .....	8
2 THE BACKGROUND OF THE STUDY .....	10
THE PROCESS OF WORD IDENTIFICATION .....	10
A Theoretical Basis .....	10
Word Identification in Beginning Reading .....	14
GRAPHIC CUES USED FOR WORD IDENTIFICATION IN BEGINNING READING .....	17
Amount of Graphic Information Used in Word Identification .....	17
Position of Graphic Information Used in Word Identification .....	20
Type of Graphic Information Used in Word Identification .....	22
MISCUE ANALYSIS AS A MEANS OF STUDYING THE READING PROCESS .....	29





Chapter		Page
	SUMMARY .....	31
3	THE EXPERIMENTAL DESIGN .....	33
	THE DESIGN OF THE STUDY .....	33
	THE SELECTION OF THE SAMPLE .....	33
	TESTING INSTRUMENTS .....	34
	ADMINISTRATION OF THE INSTRUMENTS .....	36
	SCORING OF THE INSTRUMENTS .....	38
	CODING OF THE DATA .....	38
	Establishing Categories .....	38
	Coding of Data to Categories .....	40
	ANALYSIS OF THE DATA .....	42
	SUMMARY .....	42
4	ANALYSIS AND DISCUSSION OF THE DATA .....	44
	AMOUNT OF GRAPHIC INFORMATION USED FROM THE WHOLE WORD .....	44
	Graphic Cues Used in Isolation and Context .....	45
	Graphic Cues Used by Achievement Groups .....	46
	AMOUNT OF GRAPHIC INFORMATION USED FROM INITIAL, MEDIAL AND FINAL POSITIONS .....	48
	Comparison of Isolation and Context on Amount of Information Used From Various Positions .....	48
	Initial and final positions.....	49
	Medial position .....	49
	Comparison of Achievement Groups on Amount of Information Used From Various Positions .....	50
	Initial and final positions .....	51



Chapter	Page
Medial position .....	54
Comparison of Graphic Cues Used From Initial and Final Positions .....	56
FEATURAL INFORMATION USED IN WORD IDENTIFICATION: STRAIGHT FEATURES .....	56
Amount of Straight Featural Information Used in Isolation and in Context .....	57
Straight horizontal and straight vertical features .....	57
Straight oblique features .....	58
Comparison of straight features .....	58
Amount of Straight Featural Information Used by Achievement Groups .....	60
Straight horizontal feature .....	60
Straight vertical feature .....	61
Straight oblique features .....	63
Comparison of straight features .....	64
FEATURAL INFORMATION USED IN WORD IDENTIFICATION: CURVE FEATURES .....	65
Amount of Curve Featural Information Used in Isolation and in Context .....	65
Comparison of curve features .....	66
Amount of Curve Featural Information Used by Achievement Groups .....	69
FEATURAL INFORMATION USED IN WORD IDENTIFICATION: ORIENTATION .....	69
Use of Orientation in Isolation and Context .....	70
Use of Orientation by Achievement Groups .....	70
SUMMARY .....	72



Chapter		Page
5	SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS .....	74
	SUMMARY OF THE STUDY .....	74
	MAJOR CONCLUSIONS: AMOUNT OF GRAPHIC INFORMATION USED FROM THE WHOLE WORD .....	75
	Graphic Cues Used in Isolation and Context .....	76
	Graphic Cues Used by Achievement Groups .....	76
	MAJOR CONCLUSIONS: AMOUNT OF GRAPHIC INFORMATION USED FROM INITIAL, MEDIAL AND FINAL POSITIONS ....	77
	Graphic Cues Used in Isolation and Context .....	77
	Initial and final positions .....	77
	Medial position .....	78
	Graphic Cues Used by Achievement Groups .....	78
	Initial and final positions .....	78
	Medial position .....	78
	Comparison of Graphic Cues Used From Initial and Final Positions .....	79
	MAJOR CONCLUSIONS: STRAIGHT FEATURAL INFORMATION USED IN WORD IDENTIFICATION .....	80
	Amount of Straight Featural Information Used in Isolation and in Context .....	80
	Straight horizontal and straight vertical features .....	80
	Straight oblique features .....	80
	Comparison of straight features .....	81
	Amount of Straight Featural Information Used by Achievement Groups .....	81
	Straight horizontal feature .....	81
	Straight vertical feature .....	82





Chapter	Page
Straight oblique features .....	82
Comparison of straight features .....	83
MAJOR CONCLUSIONS: CURVE FEATURAL INFORMATION USED IN WORD IDENTIFICATION .....	84
MAJOR CONCLUSIONS: ORIENTATION OF GRAPHIC CUES USED IN WORD IDENTIFICATION .....	84
Use of Orientation in Isolation and Context .....	85
Use of Orientation by Achievement Groups .....	85
IMPLICATIONS OF THE STUDY .....	86
Reading Theory .....	86
The Teaching of Reading .....	88
LIMITATIONS OF THE FINDINGS .....	89
SUGGESTIONS FOR FURTHER RESEARCH .....	89
CONCLUDING STATEMENT .....	91
BIBLIOGRAPHY .....	92
APPENDICES	
A WORD LISTS CONSTRUCTED FROM THE STANDARD READING INVENTORY .....	97
B FEATURES OF LETTERS .....	104
C FRUSTRATION LEVEL AND NUMBER OF MISCUES ON EXPERIMENTAL INSTRUMENTS .....	106



## LIST OF TABLES

Table		Page
1	Amount of Information Used From the Whole Word .....	46
2	Amount of Information Used From the Initial Position .....	50
3	Amount of Information Used From the Medial Position .....	51
4	Amount of Information Used From the Final Position ....	52
5	Amount of Straight Horizontal Featural Information Used .....	59
6	Amount of Straight Vertical Featural Information Used..	59
7	Amount of Straight Oblique / (right) Featural Information Used .....	60
8	Amount of Straight Oblique \ (left) Featural Information Used .....	61
9	Amount of Closed Curve Featural Information Used .....	66
10	Amount of Vertically Open Curve Featural Information Used .....	67
11	Amount of Horizontally Open Curve Featural Information Used .....	67
12	Orientation of Graphic Cues .....	70



## LIST OF FIGURES

Figure		Page
1	Goodman's 1970 Model of Early Reading .....	15
2	Amount of Information Used From the Whole Word .....	47
3	Amount of Information Used in Various Positions .....	53
4	Amount of Straight Featural Information Used .....	62
5	Amount of Curve Featural Information Used .....	68
6	Orientation of Graphic Cues .....	71





## Chapter 1

### THE PROBLEM

#### INTRODUCTION AND STATEMENT OF THE PROBLEM

If the teaching of reading is to be improved, an important first step is the development of an understanding of the reading process as well as the processes involved in learning to read. With this understanding, teachers will be able to develop more effective methods and select more appropriate materials for the teaching of reading.

In their attempt to describe the reading process, Weiner and Cromer (1967) suggest that beginning reading is a two stage process in which children must first identify the words before they are able to reconstruct meaning. It seems then, that while the identification of words is not of itself reading, it is a necessary step in the reading process at the beginning stage. Therefore, an understanding of the processes involved in word identification by beginning readers will help to generate a better understanding of the entire reading process.

While a number of different cue systems may be used by the reader in the identification of words, perhaps the most obvious is the graphic cue system; that is, the visual information on the printed page. Yet, in spite of its prominence, little is known about how beginning readers utilize these graphic cues.



A "feature-analytic" theory of word identification advanced by Smith (1971) suggests that words are identified by "critical sets" of "distinctive features". While this theory seems to have some validity, very little research has been presented to support or reject it. Furthermore, very few attempts have been made to isolate and identify the "features" proposed in the theory.

Therefore, in spite of this theory that suggests how children identify words, the question nevertheless remains as to precisely what graphic information they use in the process and how they learn, or fail to learn, to use it.

#### PURPOSE OF THE STUDY

The major purpose of this study was to investigate the nature of the graphic cues used by beginning grade one readers for word identification. To do this, the amount of graphic information used by the children for word identification in isolation and context was measured and compared, as was the amount of graphic information used by high, average and low beginning readers.

In making these comparisons, the amount of graphic information used by the readers was measured in three ways: from the whole word; from the initial, medial and final positions in a word; and from the featural information used by beginning readers for word identification. These three measures permitted a qualitative as well as quantitative comparison of the graphic cues used by the children.

Of the three measures, the amount of featural information used by beginning readers for word identification was of particular



interest. This measure was introduced in an attempt to determine the degree to which beginning readers use each of the "features" selected in the study, and to test the possibility that the use of these "features" may reflect processing differences in the word identification of beginning readers.

## HYPOTHESES

In order to achieve the purposes set out in this study, the following null hypotheses were formulated and tested:

### Hypothesis 1.10

There is no significant difference in the amount of graphic information used from the whole word,

1.11 by beginning readers for word identification in isolation and in context,

1.12 for word identification by high, average and low beginning readers.

### Hypothesis 2.10

There is no significant difference in the amount of graphic information used,

2.11 by beginning readers for word identification in isolation and in context,

2.12 for word identification by high, average and low beginning readers,

from: (a) the initial position in words,

(b) the medial position in words,

(c) the final position in words.





### Hypothesis 3.10

There is no significant difference in the amount of graphic information used,

3.11 by beginning readers for word identification in isolation and in context,

3.12 for word identification by high, average and low beginning readers,

from the following features:

- (a) straight horizontal,
- (b) straight vertical,
- (c) straight oblique / (to the right),
- (d) straight oblique \ (to the left).

### Hypothesis 4.10

There is no significant difference in the amount of graphic information used,

4.11 by beginning readers for word identification in isolation and in context,

4.12 for word identification by high, average and low beginning readers,

from the following features:

- (a) closed curve,
- (b) vertically open curve,
- (c) horizontally open curve.



### Hypothesis 5.10

There is no significant difference in the use of orientation,  
 5.11 by beginning readers for word identification in  
 isolation and in context,  
 5.12 for word identification by high, average and low  
 beginning readers.

### DEFINITION OF TERMS

The following terms used in this study are defined as follows:

Word Identification - is a two stage process in which a beginning reader discriminates a visual configuration from all other possible configurations and attaches a label or name to it indicating that the configuration has been identified (Weiner and Cromer, 1967).

Distinctive Features - are the properties of letters that can be used to differentiate them from others. In this study, the term refers specifically to those features listed in Appendix B.

Graphic Cues - refers to the visual stimuli on the printed page and includes letters, the order in which letters occur and the features of letters.

Beginning Reader - is a child who has had approximately six and one half months of formal reading instruction.



Isolation - refers to the condition in which words are presented randomly in lists.

Context - refers to the condition in which words are presented in connected discourse.

High Readers - are those grade one children having an average standard score between 64.5 and 74 on the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test, Primary A, Form 1.

Average Readers - are those grade one children having an average standard score between 58 and 64.5 on the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test, Primary A, Form 1.

Low Readers - are those grade one children having an average standard score between 46 and 58 on the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test, Primary A, Form 1.

#### SIGNIFICANCE OF THE STUDY

This study was designed to provide information about the nature of the reading process. Specifically, it was an attempt to investigate the nature of the graphic information used in word identification by beginning readers. If more can be learned about how beginning readers use and learn to use these graphic cues, teachers will be better able to help the children learn to read.





As a means of studying the reading process, the graphic cues used by beginning readers in isolation and in context were compared. This comparison provides information about the nature of the graphic cues used by beginning readers in each of these conditions. A better understanding of the processing differences in reading words in isolation and context will allow teachers to adjust teaching methods and materials to bring about desired changes in reading behavior.

The graphic cues used by accomplished and less able beginning readers were also compared in this study. This provides some information with respect to the processing differences of children who learn to read relatively easily and those who have more difficulty. If teachers are aware of these differences, they will be able to more easily identify reading problems and adjust methods and materials to suit the needs of the children.

The study also makes a contribution to the development of reading theory by providing information respecting the use of selected "features" by beginning readers. In addition, by considering the effects of conditions of presentation and level of reading achievement on the miscues, it also gives some indication of the usefulness of miscue analysis for teachers and clinicians.

#### LIMITATIONS AND DELIMITATIONS

The following limitations and delimitations should be observed when considering the findings of the study:

1. The graphic cues examined in this study were of necessity extracted from words in which the reader did not properly



identify one or more parts. It was not possible to obtain an indication of the graphic cues used in words which were correctly identified.

2. The establishment of graphic cue categories and the criteria for placing cues in those categories was at least partially arbitrary and does not pretend to represent all possibilities.
3. An oral production on the part of the reader was necessary in order to obtain a measurement of the graphic cues used. The results are valid only to the extent that the oral response is an accurate indicator of the graphic cues actually used by the reader in the internalized processing of the visual stimuli.
4. This study does not attempt to distinguish between immediate word identification (when the reader goes directly from the visual stimuli to meaning) and word identification that is mediated by some form of analysis.

#### PLAN OF THE INVESTIGATION

The investigation is reported according to the plan indicated below:

Chapter 2 presents the theoretical framework within which the study is conducted. In addition, it presents a review of the research studies on the word identification process.

Chapter 3 describes the experimental design of the study.

Chapter 4 presents an analysis and discussion of the data.



Chapter 5 presents a summary of the study, the major conclusions and a discussion of the findings in relation to previous research, implications, limitations and suggestions for further research.





## Chapter 2

### THE BACKGROUND OF THE STUDY

This chapter is designed to provide the theoretical and experimental framework from which the present investigation emerges. Specifically, the chapter will present the theoretical basis within which the process of word identification is considered. Further, it will consider the nature of word identification in beginning reading. In addition, the chapter will review the research studies which have investigated graphic cues used for word identification in beginning reading. Finally, the chapter will consider the use of miscue analysis as a means of studying the reading process.

### THE PROCESS OF WORD IDENTIFICATION

#### A Theoretical Basis

Smith (1971) suggests that there are two distinct aspects of word identification--the discrimination of a particular visual configuration from other configurations, and the categorization of that visual configuration. In the discrimination phase, the visual stimulus is simply recognized as something that has been seen before and is uniquely different from other visual configurations. In the second or categorization phase of word identification, a name is associated with the visual configuration indicating that the configuration has been assigned to a particular word category. Therefore, when a visual configuration has been discriminated from all other



possible configurations, and when the proper label or name has been associated with the configuration, word identification has taken place.

Although any consideration of word identification must necessarily consider both of the above-mentioned aspects, the following theoretical discussion is concerned primarily with the discriminatory phase of word identification.

The problem of how words are identified is a part of the broader question of pattern recognition. Neisser (1967) has identified the two main theoretical approaches to the problem of pattern recognition as the "template matching" theory and the "feature-analytic" theory.

The "template matching" theory assumes that patterns are recognized through prototypes or canonical forms stored within the mind of the perceiver. Visual configurations are then compared with these "templates" for identification. Both Neisser (1967) and Smith (1971) reject this theory for several reasons. First of all, forms can be recognized in new positions and despite changes in size. Also, letters can be recognized in different face types and styles. In addition, if the theory is to explain all pattern recognition, it is necessary to hypothesize the existence of vast numbers of templates as well as an extremely cumbersome process of matching patterns perceived in rapid succession with the proper template. And so, it seems that the "template matching" theory creates at least as many problems as it solves and both Neisser and Smith reject it in favour of a more satisfactory explanation.



Neisser (1967) views perception as a constructive process in which the subject uses relevant features abstracted from the visual configuration and synthesizes them into the pattern perceived. In this sense then, perception is not an external relatively objective act, but an internalized highly subjective process influenced greatly by the context within which the perception takes place and the expectations ("set") of the perceiver.

Although Neisser posits the existence of "features", he makes no attempt to describe or define them. He does, however, suggest that there must be a process by which an individual selects only portions of the total amount of incoming information for detailed analysis. He therefore suggests two levels of analysis: preattentive mechanisms which form chunks of information for further processing and focal attention mechanisms which make a sophisticated analysis of the chosen features and synthesizes them into the pattern perceived.

A "feature-analytic" theory is used by Smith (1971) to explain word identification in reading. After rejecting the three traditional theories of word identification (whole-word identification, letter by letter identification, and the identification of words through letter clusters), he applies the "feature-analytic" theory to both letter and word identification.

Because both letters and words are patterns, Smith suggests that they are identified through the use of featural information, or more specifically, what he calls "distinctive features." He defines these distinctive features as "properties of a stimulus configuration



that can be used to differentiate it from others" (p. 109). The particular combination of features which make it possible to identify a word are considered to be a "critical set" and more than one critical set of features may exist for any one word category. Therefore by abstracting one of the critical sets of features for a particular word category, the word may be identified without necessarily identifying any of the individual letters which constitute the word.

Smith further points out that there are actually two sources of information available for the identification of words: featural and sequential information. While the featural information is available on the page, the sequential information (the knowledge of how words are constructed) exists within the reader. By using this knowledge of the sequences of letters and features within words, a skilled reader can reduce the amount of featural information necessary for the identification of a word.

However, Smith's "feature-analytic" theory of word identification has a basic difference from the view of perception advanced by Neisser. Neisser (1967) emphasizes the synthetic nature of perception. That is, features of a visual stimulus are synthesized into a recognizable pattern by the viewer. This suggests that perception is a constructive process. Conversely, Smith (1971, 109) suggests that perception is an analytic process in which "feature analyzers" perform a series of tests on the visual input to "reduce uncertainty."

In summary then, the "feature-analytic" theory upon which this study is based suggests that a person identifying words in the act of reading is engaging in a constructive process utilizing the distinctive





features of the visual configuration. In addition, that person is using his knowledge of the orthographic and featural redundancy that exists within words to reduce the number of features necessary to identify a word. Finally, the end product of this constructive process will be greatly influenced by the context within which it takes place and by the expectations ("set") of the reader.

### Word Identification in Beginning Reading

Neisser (1967) defines reading as "externally guided thinking" (p. 136). He then goes on to suggest that in rapid reading, meaning is attained without identifying individual words. In both of these instances, however, Neisser is referring to proficient reading. But, the evidence suggests that the processes used by beginning readers are quite different from those used by proficient readers.

Weiner and Cromer (1967) posit a two stage process for beginning readers. They suggest that beginning readers must first identify the words before they are able to reconstruct meaning. Mackworth (1972) agrees with this view of beginning reading and suggests that this is particularly true of oral reading.

In his consideration of the nature of beginning reading, Smith (1971) comes to the same conclusion. He suggests that readers may utilize information from graphic, syntactic and semantic cue systems in the process of reconstructing meaning. He further points out that there is a great deal of redundancy or overlap within these three cue systems and that fluent readers are able to use this redundancy to lessen their dependence on the visual information on the printed page. The beginning reader, however, has not yet acquired



the necessary reading experience to utilize the redundancy within the cue systems to his best advantage. He therefore finds it necessary to depend heavily on the graphic information. As Smith states it, "The more difficulty a reader has with reading, the more he relies on the visual information" (p. 221).

Goodman (1970) presents a model of reading in the early stages.

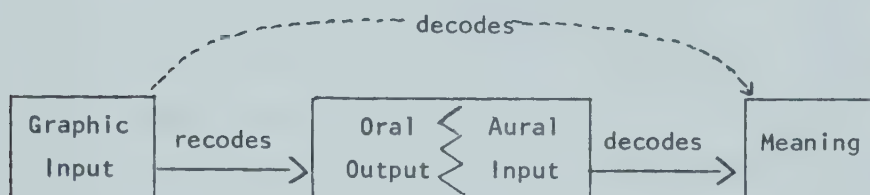


Figure 1

#### Goodman's 1970 Model of Early Reading

In explaining the model, Goodman states, "The child here recodes graphic input as speech (either out loud or internally) and then, utilizing his own speech as aural input, decodes as he does in listening" (p. 17). The model does suggest that even in the early stages of reading, there is some direct decoding from print to meaning. However, the main point of interest here is that the model suggests that early reading is heavily dependent on word identification as a necessary prerequisite to the reconstruction of meaning.

Also evident in Goodman's model is the suggestion that oral and silent reading processes are similar in the early stages of reading. McCracken (1967), noting that children in grades one and



two read silently and orally at the same rate, comes to the same conclusion. Goodman (1968) reports that children in grades three and four read at a slightly faster rate, but it is not until grade six that there is a pronounced difference between oral and silent reading rates. He concluded that oral and silent reading processes are quite similar in the early stages of reading.

It seems reasonable to conclude, then, that beginning readers are relying heavily on the visual information on the printed page. It also seems that for beginning readers this process is the same in both oral and silent reading.

This is not to assume, however, that children use only visual information in reading. In fact, a number of studies have demonstrated that children use contextual as well as graphic cues in their reading.

MacKinnon (1959) observed grade one children as they read orally and noticed that they seemed to rely on different cue systems depending on the particular stage to which they had advanced in the process of learning to read. Biemiller (1970), in a longitudinal study of grade one students, examined their use of graphic and contextual cues as they learned to read. In essence, he found that beginning readers rely at first on contextual cues, progress to the use of graphic cues and finally arrive at the stage where they are able to integrate information from both cue systems. A similar study of forty grade one children by Fleming (1974) seems to substantiate Biemiller's findings in that he was able to locate children in the sample who were at the various stages described by Biemiller.



And so, beginning readers seem to use both visual and contextual information when reading. This does not, however, alter the fact that they rely heavily on visual information whether reading words in isolation or in context.

#### GRAPHIC CUES USED FOR WORD IDENTIFICATION IN BEGINNING READING

There have been a great many studies of graphic cues used for word identification in beginning reading. The researchers have observed the problem from many different points of view and have employed a variety of approaches in examining the problem. Any meaningful consideration of the research must find some common basis or focus within which to examine the studies. Therefore, the following research is examined within the context of the theoretical framework already presented in this chapter. To further structure the discussion, the studies are grouped within three general categories: those that consider the amount of graphic information used in word identification, those that consider the position of the graphic cues used and those that consider the type of graphic cues used.

##### Amount of Graphic Information Used in Word Identification

Samuels and Jeffrey (1966), in a study of beginning readers, found that it took children longer to learn word lists containing words similar in appearance than it took to learn word lists containing contrasting words. However, they found that the learning of the words from the similar list was more complete. They concluded





that the lists containing the similar words forced the children to use more than single letter cues.

Marchbanks and Levin (1965) used a delayed matching-to-sample procedure in a study of kindergarten and grade one children. They used three and five letter pseudo-words each of which represented one possible systematic error that might be made. They found that specific letters were much more important in determining identification of words than was the over-all shape of the word.

The study was replicated by Williams, Blumberg and Williams (1970) using socio-economically disadvantaged children. They felt that these children probably had not been exposed to letters and words to as great a degree as those in the first study. Seventeen kindergarten and fifteen grade one children were used in the study. In addition, thirty-two university students were also included. After participating in the experiment, these adult subjects were asked to describe how they identified words and their introspective reports were also considered in the study. The researchers concluded that beginning readers have a strong tendency to use single letter cues to identify words. This differed from the adults who seemed to use more visual information and a variety of strategies in identifying words.

Singer, Samuels and Spiroff (1974) studied the effect of four different methods of presenting words on the acquisition of reading responses by beginning readers. The sample consisted of 164 first and second grade children. The four methods of presentation were: word alone, word in association with a picture, word embedded in a sentence and word in a sentence plus a picture. They found that the



children did best when the words were presented in isolation. They concluded that this was due to the fact that there were no other stimuli on the page to misdirect the attention of the children as is the case when words are presented in context. Without "distracters" then, the children appeared to be able to use a greater amount of visual information from the stimulus word.

Weber (1970) studied the oral reading errors of grade one children. She measured the average "graphic similarity" of substitution errors by noting the proportion of letters in common to both the error response and stimulus word. She found that the proportion of graphic similarity was higher in the last three months of grade one than in the preceeding three months. In addition, she found that the abler half of the class made substitution errors that were substantially more similar to the stimulus words than errors made by the lower half of the class.

On the basis of these studies, it is possible to render a number of observations about the amount of graphic information used for word identification by beginning readers. It seems that the amount of graphic information used varies depending on the degree to which the reader has progressed in the process of learning to read. The evidence suggests that good beginning readers are able to use more graphic information in identifying words than are below average readers. It also seems that the amount of graphic information used in reading words in isolation and in context differs.



### Position of Graphic Information Used in Word Identification

Broerse and Zwaan (1966) used seven letter Dutch nouns in their study designed to determine the information value of letters in the initial and final positions of words. Forty-eight children were first taught to recognize the twenty-four Dutch nouns. Cards were then presented to each child with either the first two or the last two letters of each word and the time needed to identify the word was recorded. The children needed significantly less time to identify the words from the initial letters than from the final letters. From these results, the researchers concluded that the initial part of words contain more useful information than the final part. These results are in agreement with the findings of Huey (1910) who reported that text from which the second half of words were deleted could be read more easily than text from which the first half of words were deleted.

Bennett (1942) analyzed the errors in word identification made by grade three and four "retarded readers." She concluded that the children were identifying words mainly by beginnings and endings. She further noted that the children used information from beginnings of words twice as often as information from endings.

A recent study of grade four children by Samuels, Begy and Chen (1975) utilized a 2 x 3 Factorial Design with repeated measures to examine word identification strategies. Target words were presented in three conditions: with the first letter of the word, with the first two letters of the word and with the first and last letters of the word. Missing letters were indicated by dashes. Each target word



was preceded by an adjective to provide some "contextual" information. They found that the good readers performed significantly better than the poor readers in identifying the target words. In addition, the children performed best when only the first letter of the target word was given. They were slightly less accurate in identifying the target words when the first two letters of the target word were given, and least accurate when the first and last letters were given.

Similar results were obtained in three studies of grade one students already cited in this chapter. Marchbanks and Levin (1965) found that boys used the first letter most, the last letter less and the second letter least in identifying words in isolation. The girls, however, used the first letter most, the second letter less and the last letter least in identifying the words. In a replication of the study, Williams, Blumberg and Williams (1970) concluded that the initial letter was the most useful cue for beginning readers. However, the adults included in the study performed somewhat differently. In identifying the quingrams, they seemed to use all letter cues equally well with the exception of the fourth letter which they used less. On the trigrams, they concluded that the adults displayed a greater tendency to identify the words on the basis of the second and third letters than did the children. In her study of children reading contextual material, Weber (1970) found that 53% of the substitution errors made by children had the same first letter as the correct word, that 29% had the first two letters in common, that 31% had the last letter in common and that 14% of the substitution errors had the last two letters in common with the correct word.





In her study of the oral reading errors of fifty grade one children, Cohen (1975) concluded that poor readers, for the most part, used first and last letter cues to identify words. The good readers, however, appeared to be more systematic than the poor and were able to explore words and learn salient letter combinations.

On the basis of these studies, it is possible to render a number of observations about the position of graphic information used for word identification by beginning readers. It seems that beginning readers use more graphic information from various parts of words depending on the degree to which they have progressed in the process of learning to read. It seems that graphic information from beginnings of words is used most followed by that from the endings of words. However, it appears that as children become more proficient, they are able to utilize graphic information from other parts of words as well, thus facilitating word identification.

#### Type of Graphic Information Used in Word Identification

The "feature-analytic" theory described earlier in this chapter represents the theoretical basis within which the process of word identification is considered in the present investigation. This theory suggests that words are identified by their distinctive features. Although it is difficult to establish with certainty exactly what these distinctive features are, a number of researchers have attempted to isolate and describe some of them.

Lott, Smith and Cronnell (1968) proposed that the normal reader does not pay attention to individual letters, but to sets of features which are characteristic of a word as a whole. To test this assertion,



they constructed six passages and presented them to 216 college students under six different typographic conditions. Each student was exposed to three passages containing constant size type and three passages containing type mixed in size. The students were presented with twenty words and asked to locate them in each of the passages and their score was determined by the number of words correctly identified in  $2\frac{1}{2}$  minutes. The students performed significantly better on the three passages containing constant size type. The researchers concluded that disruption in the "total word form" does not interfere with one's ability to identify words unless the discriminability of the elements is disrupted. This would suggest that the subjects were attending to the features of words rather than to letters.

A study rebutting the idea that letters are sequentially processed in reading was conducted by Newman (1966). In this study, a motion picture film was used to expose each subject to a limited number of letters which appeared to move from right to left on a screen. Spans of one, two, three, four, six and eight letters were presented to each of the subjects at varying rates so that at any given rate of exposure, the same amount of information was present whether the span was one letter or eight. Newman found that text with a string of eight letters that could be read with 96% accuracy became almost unintelligible as single letters. These results suggest that word identification involves more than the identification of individual letters and were therefore considered to be support for a feature-analytic theory of word identification.



A similar study was undertaken by Kolers and Katzman (1966) utilizing 125 university students. Letters forming familiar words were projected on a screen sequentially and the subjects were asked to name the letters or the words they represented. They found that all of the letters could be identified while the word went unrecognized, and came to the same conclusion as Newman.

Smith (1969) used thirty-eight university students in a study designed to test the hypothesis that sequences of letters, whether or not they are words, are identified by two kinds of information: featural information and statistical information derived from sequential dependencies (redundancy) within a sequence of letters. Words of five different list types were projected below threshold and gradually increased until each subject could identify one or more letters. Smith found that words were identified more easily than non-words and that letters in words were identified more easily than letters in isolation. He concluded that the identification of both letters and 'whole words' is based on the discrimination of features and the ability to make use of sequential dependencies among features.

Although the study did not involve word identification per se, one of the earliest attempts to study actual distinctive features was made by Gibson and Gibson (1955). They used a set of eighteen scribbles differing from a standard scribble along three dimensions of variation: number of coils, degree of compression and orientation. The task of the subjects was to recognize the standard item whenever it appeared in a pack of cards. They found that the number of errors



increased as there was a decrease in the number of stimulus variables by which an item differed from the standard. On the basis of these results, it would seem that confusion errors in letter identification might be predicted if the features of letters could be identified. Or conversely, the reality of proposed feature lists might be investigated by testing the degree to which confusions between letters could be predicted from the feature lists.

One such study, using university, grade six and grade two students, was made by Yonas and Gibson (1967). The subjects were given a matching task in which nine letters were paired with one another and themselves. The performance of the subjects was timed and comparisons were made on the basis of one letter, three letters and three letters having a common distinctive feature (diagonal). As was expected, they found that subjects were able to match single letters with the most speed and accuracy at first, while the two conditions with three letters evidenced slower response latencies. As was also expected, the response latency of the subjects for the group of three letters with the common diagonal feature fell with practice to a level comparable to that of the single letters. They concluded that the data were supportive of a distinctive feature theory of letter discrimination.

In another study, Gibson, Gibson, Pick and Osser (1962) examined the abilities of children from four to nine years of age to discriminate letter-like forms. They constructed a set of forms comparable to Roman capitals consisting of straight and curved joined lines. In all there were twelve forms with twelve variants of each





form. The children were required to compare a standard with its variants and to select and hand to the experimenter only exact copies of it. An error consisted of choosing as "same" as item that did not exactly match the standard. An analysis of the results indicated that errors decreased from age four through eight, but the rate of decline was quite different for different types of transformations. Young children had the most difficulty with perspective transformations, less difficulty with rotations and reversals, and still less difficulty with line to curve transformations. The break and close transformations were the easiest for the young children to detect.

While the above-cited study begins to address itself to the problem of identifying possible distinctive features of letters, the study by Gibson, Osser, Schiff and Smith (1963) is an actual attempt to establish some feature lists for letters. They analyzed a set of graphemes and prepared a list of distinctive features for them. The lists were used to predict confusions between the various letters and an error matrix of confusions was obtained to test the predictions. A large group of non-reading four year old children was given a simple matching task in which one letter was presented as a standard followed by a multiple choice set of six letters. The results suggest that the feature list has some validity, but needs more refinement. However, among those features that did seem to have some significance were: open vs. closed, straight vs. curved, and relative diagonality.

Other studies that suggest distinctive features that may be used by children in identifying letters are those that examine the letter confusions that children make. In one such study, Popp (1964)



used five and six year old kindergarten children. They were given a two choice matching-to-sample task using lower case letters. She found that confusions were greatest among letter pairs which were reversals or rotations of one another (eg. b-d, b-p), while letter pairs whose major difference was a break or close (eg. o-c) showed few errors. In addition, she found that the formal similarity of certain letters (eg. i-l, h-n) produced some confusions.

Another study by Dunn-Rankin (1968) utilized 215 grade two and three children and the twenty-one most commonly used lower case letters of the alphabet. The children were given a target letter plus five pairs and asked to choose the letter of each pair that looked most like the target letter. The investigator assumed that those letters judged most similar would most likely be confused. The results suggest that letters which are reversals and rotations of one another (eg. b-d, d-p, n-u) are highly confusable. In addition, a factor analysis revealed that certain structural characteristics such as short curved letters (eg. a-s-e) can be contrasted with taller, central line dominated letters (eg. l-t-i).

In a similar study of letter confusability, Dunn-Rankin, Leton and Shelton (1968) suggest that an index of area in common among letters under axial rotation may help in predicting confusions. A factor analysis, strictly based on the scores from such an index, revealed five factors for the lower case letters. The five letter clusters were as follows:



1. p, b, q, d
2. i, f, l, j, t
3. y, v, x, w, z, k, s
4. n, u, m, h
5. e, c, o, s, a

An examination of these clusters and those of the previous study, suggests that they have a remarkable similarity to those features described by Gibson (1970) as "curve vs. straight, roundness, squareness and diagonality" (p. 429). She suggests that these are some of the features that children use in discriminating between letters.

Deich (1971), utilizing 120 children in grades two, six and eight, investigated their use of orientation in reading. In this study, each child read both upright and inverted passages. She found that the difficulty of reading inverted rather than upright words increased with increasing grade level. She therefore concluded that for young children, form is largely independent of orientation. The fact that they do not see orientation as a critical feature is reflected by the reversal and rotation confusions evident in some of the studies cited previously.

While these studies, individually or collectively, are not able to provide the complete answer to the question--what are the distinctive features used by children to identify words when they are reading?--they do nevertheless provide a point of departure for the present study and suggest a number of possible "distinctive features" that may be used in the process of word identification by



beginning readers. These studies then, serve as the basis from which the "features" used in the present investigation are generated.

#### MISCUE ANALYSIS AS A MEANS OF STUDYING THE READING PROCESS

Most studies in the past have focused on reading achievement, reading skills or correlates of reading. In recent years, however, many studies have begun to focus on the reading process and in particular on the processes involved in learning to read. But these studies inevitably encounter two basic problems. First, these studies are attempting to investigate the nature of human cognitive processes and these processes are by nature extremely complex. Because of this, any study must necessarily be limited to only a small part of the total process. But the second is perhaps even more basic. The processes themselves cannot be observed directly. Therefore, researchers have devised various indirect methods of observing them. Among other techniques, they have used specifically constructed word lists, eye movement studies, introspective questioning, and tachistoscopic studies.

One of the most promising methods of studying the reading process, however, is the observation and analysis of oral reading miscues. This is by no means a new method of examining reading. Bennett (1942) analyzed the oral reading errors of children in the middle grades. Morton (1964) used the same method in a study of university students reading passages that were statistical approximations of English.





Goodman's (1965) descriptive study of the oral reading of grades one, two and three children marked another stage in the development of miscue analysis as a technique for studying the reading process. In this study he described reading as a "psycholinguistic process" in which reading behavior is cued or miscued during the child's interaction with written language. Some insight into the nature of this interaction can be gained by examining the miscues made by the reader. As Goodman (1973) suggests, these miscues are "windows on the reading process" (p. 3).

A Taxonomy of Cues and Miscues in Reading was constructed by Goodman and Goodman (1965) and a revised edition was published by Goodman (1969). Basically, the taxonomy permits the categorization of reading miscues to reflect the interaction of graphic, syntactic, and semantic cues systems in reading. Once the information has been categorized, inferences can then be made about the processes involved as the reader interacts with written language.

Since its inception, miscue analysis has been used widely in research studies. Among others, Goodman (1967), Clay (1967), Irwin (1969), Weber (1970), Biemiller (1970), Fleming (1974), Binkley (1975), and Cohen (1975) have used miscue analysis. It seems then, that miscue analysis is an established research tool.

However, miscue analysis does have some limitations. As only the miscues of the children are used, it is necessary to make the assumption that children making an incorrect response are using the same cues and strategies when making a correct response. Also, since miscues are identified from oral reading, it is necessary to



assume that children reading orally are using the same cues and strategies in oral and silent reading.

After considering the advantages and limitations of miscue analysis as a research method, it was chosen as the best alternative available for the present study.

#### SUMMARY

This study proceeds from a "feature-analytic" theory of word identification. This theory holds that word identification is a constructive process utilizing the distinctive features of a visual configuration. Orthographic and featural redundancy reduces the number of features necessary to identify a word. Context and the expectations ("set") of the reader also influence the process of word identification.

Beginning readers seem to use both visual and contextual information when reading, but nevertheless rely heavily on visual information whether reading words in isolation or context. It appears that beginning readers use differing amounts of graphic information in isolation and context, and that good beginning readers use more graphic information than less able beginning readers.

The evidence suggests that beginning readers rely most heavily on the graphic information from beginnings of words, followed by that from the endings of words. However, as children become more proficient in word identification, they are able to utilize graphic information from other parts of words as well.



A number of studies suggest some distinctive features that may be used in the process of word identification by beginning readers. These studies serve as a basis from which the "features" used in the present study are generated.

Because miscue analysis is a useful research tool that provides a method of at least indirectly studying the processes of reading and learning to read, it was chosen as the best available alternative for the present study.



## Chapter 3

### THE EXPERIMENTAL DESIGN

This chapter will describe the design of the study, the selection of the sample, the selection and construction of the testing instruments, the administration and scoring of the tests, the coding of the data, and the analysis of the data.

### THE DESIGN OF THE STUDY

The study employed a 3 x 2 Factorial Design with repeated measures utilizing three reading achievement groups (high, average, and low) and two conditions (words in isolation and words in context). The dependent variables were the amount of graphic information used from whole words, the amount of graphic information used from specified positions in words and the amount of featural information used by the children when reading passages and word lists.

### THE SELECTION OF THE SAMPLE

The test sample was drawn from one elementary school assigned to the investigator by officials of the Edmonton Public School Board. The school served a population consisting largely of middle class families and was selected in a deliberate attempt to control for the influence of socio-economic status.

The initial test sample consisted of 64 students in the three grade one classrooms of the school. Those students having an average





standard score of less than 46 on the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test, Primary A, Form 1 (1965) were identified as non-readers and excluded from the sample. Also eliminated from the sample were those children who spoke English as a second language and were not able to speak the language well enough to facilitate an accurate recording of their oral responses. The final test sample consisted of 48 children.

The children were assigned to three reading achievement groups (high, average and low) on the basis of the average standard scores obtained on the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test, Primary A, Form 1. The high group consisted of those children having an average standard score between 64.5 and 74, the average group consisted of those children having an average standard score between 58 and 64.5, and the low group consisted of those children having an average standard score between 46 and 58.

At the time of testing, the children had received six and one half months of beginning reading instruction utilizing the Ginn Basic Readers (Revised 1961) and the Nelson Language Development Reading Program (Revised 1973).

#### TESTING INSTRUMENTS

Three tests were used in this study: the Gates-MacGinitie Reading Tests (1965), the Standard Reading Inventory (1966), and word lists constructed from the Standard Reading Inventory.



The Gates-MacGinitie Reading Test, Primary A, Form 1, was used to obtain a measure of each child's reading achievement level. It is composed of two subtests: a fifteen minute test of vocabulary and a twenty five minute test of comprehension. The test was normed on 40,000 pupils in the United States, and both February and May norms are available for each subtest. The alternate-form reliability of the test is 0.86 (vocabulary) and 0.83 (comprehension), while the split-half reliability is 0.91 (vocabulary) and 0.94 (comprehension). The three reading achievement groups were established on the basis of the test.

The Standard Reading Inventory was used to obtain a sample of the oral reading miscues of each of the children when reading words in context. The selections on this reading inventory were of sufficient length to yield an adequate sample of oral reading miscues (20 to 25) for each child. The instrument ranges in reading levels from pre-primer to grade seven. But, because all of the children began reading at the pre-primer level and were required to continue only until they reached their "frustration" reading level (less than 90% accuracy in word identification), it was necessary to use only the selections from pre-primer to grade three of Form A. The content of the inventory is based upon three basal reading series: The Sheldon Basic Readers (1958), The Ginn Basic Readers (1960), and Curriculum Foundation Series (1952). Content validity was obtained by control of vocabulary, sentence length, content, and style. The Spache Readability Formula (1961) was used to analyze the basal readers and to act as a guide in writing the stories from primer to



high grade three levels. The alternate-form reliability of the test is 0.91 ( $p = .0001$ ).

Word lists constructed from the selections on the Standard Reading Inventory were used to obtain a sample of the oral reading miscues of each of the children when reading words in isolation. All of the words appearing in the stories used were included in the lists. A separate list was constructed for each passage of the Standard Reading Inventory. To avoid repetition and shorten the testing time, each word appeared only once in the lists.

#### ADMINISTRATION OF THE INSTRUMENTS

The Gates-MacGinitie Reading Test, Primary A, Form 1 was administered during the third week of March 1976. All tests were administered by the investigator to each of the three classes in groups of 21, 23 and 20. The test was administered to each group in one sitting with a rest period between the vocabulary and comprehension subtests.

The passages from the Standard Reading Inventory and the word lists constructed from the passages were administered during the first two weeks of April, 1976. The passages and word lists were administered on an individual basis in sessions ranging from ten to thirty-five minutes. A table of random numbers was used by the investigator to counterbalance the administration of the passages and word lists to control for order effects. The passages and word lists were read orally by each of the children beginning at the pre-primer level and continuing until they reached "frustration" level. Frustration level



was defined as less than 90% accuracy in word identification for the passages of the Standard Reading Inventory, and was set as less than 75% accuracy in word identification for the word lists. The lower cut-off point for the word lists was necessary in order to ensure an adequate sample of oral reading miscues for words in isolation. All oral reading responses of the children were tape-recorded to facilitate the recording of miscues and to provide further opportunity for analysis.

In order to minimize the possibility that reading the word lists first might influence performance on the passages or vice versa, the investigator refrained from prompting the children when they were unable or unwilling to respond to the graphic stimulus. Instead, the children were first encouraged to attempt the word. In the event that they still did not respond, they were asked to omit the word and continue.

In this study, the amount of graphic information used by beginning readers in isolation and in context was being compared. However, when reading the passages, some children might have resorted to reading without attention to meaning. This "word calling" from the passages is probably very similar to reading words in isolation, the difference being that the words are "called" from horizontal rather than vertical lists. Therefore, it was necessary that the children view the reading of the passages as a meaning-seeking activity. In order to reinforce this view of reading and to discourage the children from lapsing into "word calling" with no attention to meaning, each child was asked a series of comprehension questions after reading each of the passages.





All administration of tests and recording of miscues were done by the investigator.

### SCORING OF THE INSTRUMENTS

The Gates-MacGinitie Reading Tests were marked according to the answer keys provided and standard scores were obtained from the norms provided in the Teacher's Manual. Since the children had received the test during the third week of March, February norms were used in determining standard scores for them.

To obtain one average reading score for each pupil, standard scores obtained on the vocabulary and comprehension subtests were averaged. This is a valid procedure since the standard scores are based on an equal-interval scale.

The oral reading errors on the passages from the Standard Reading Inventory and the word lists were marked as the child read and/or from the tape recordings of the reading. All observed oral reading responses that did not match the expected response, including those miscues that were self-corrected, were recorded. In order to facilitate the analysis of the data, lists containing the observed and expected responses for each of the children were prepared from the recorded data.

### CODING OF THE DATA

#### Establishing Categories

Before any effective analysis could be made, it was first necessary to establish categories for the coding of the data.



Based on a preliminary examination of the data and a review of the related research, it was decided to consider the data under three categories: the amount of graphic information used from whole words, the amount of graphic information used from specific positions in words and the amount of featural information used by the children for word identification.

The category of position was partitioned to identify initial position (the first letter), final position (the last letter), and medial position (all other letters except those in the initial and final positions). Since the study was primarily designed to compare the three reading achievement groups and the two experimental conditions (words in isolation and words in context), and not the positions, it was not necessary that the positions contain equal amounts of information.

The category of featural information was also partitioned to identify a number of specific features upon which a further comparison of the reading achievement groups and experimental conditions could be made. These features were generated from the theoretical position described (pp. 10-14) and the experimental studies previously discussed (pp. 22 - 29) in Chapter 2. Those features used in this study include: straight horizontal, straight vertical, straight oblique / (right), straight oblique \ (left), closed curve, vertically open curve, horizontally open curve, and orientation. A detailed listing of these features and the letters in which each feature occurs may be found in Appendix B.



### Coding of Data to Categories

Because the number of words miscued varied from child to child and the number of words miscued also varied between the two conditions of isolation and context for each child, it was necessary to record all of the data in terms of percentage scores. This was done by comparing the total amount of information used by each child in each category, as indicated by the observed response, with the total amount of information available to the child in the graphic stimulus, the expected response.

The amount of graphic information used from the whole word was determined by dividing the number of letters shared by both the expected and observed response by the total number of letters in the expected response. The particular order of the letters was not considered in this measure. The result for each word was expressed as a percentage. An average percentage score was then obtained for each child for words read in isolation and the procedure was repeated to obtain a score for words read in context.

The amount of graphic information used from the initial position was determined by dividing the number of initial letters shared by both the expected and observed responses by the total number of expected responses. The result was expressed as a percentage score for each student for words read in isolation and the procedure was repeated to obtain a score for words read in context. The amount of graphic information used from the final position was determined by the same procedure. However, when the amount of graphic information used from the medial position was determined, there was



one difference in the procedure. Since the medial position contained varying numbers of letters, the child was judged to have "not used" the graphic information from the medial position unless the letters in the medial position of the observed response occurred in the same sequence in the expected response.

The amount of featural information used by each child for word identification was determined for each individual feature category by dividing the number of times that a particular feature was shared by both the observed and expected response by the total number of times the feature occurred in the expected response. This comparison was made strictly on a featural basis with no regard for the particular letters of words. The result was expressed as a percentage score for each child for words read in isolation and a second score was obtained for words read in context. The entire procedure was repeated for each of the feature categories.

Upon completion of the coding, the data for each child included a percentage score for each of the experimental conditions of isolation and context on each of the twelve categories described. These percentage scores were the dependent variables of the study. The scores then, were obtained for amount of information used from each of the following: the whole word, initial position, medial position, final position, straight horizontal, straight vertical, straight oblique / (right), straight oblique \ (left), closed curve, vertically open curve, horizontally open curve and orientation.

All coding of the data was done by the investigator and an assistant with a Doctor of Philosophy degree in Elementary Reading.





## ANALYSIS OF THE DATA

The data were analyzed using the computing facilities of the Division of Educational Research Services at the University of Alberta. The statistical treatment of the data included two-way analysis of variance and Newman-Keuls multiple comparison tests of means.

A two-way analysis of variance was carried out on each of the twelve variables using the computer program ANOV 23. This analysis was used to identify statistically significant differences between the three reading achievement groups, between the two experimental conditions, and to identify statistically significant interactions between the groups and conditions.

A Newman-Keuls multiple comparison test was then carried out on those variables on which there was a statistically significant difference between the reading achievement groups. These tests made it possible to identify the source of the difference.

For all analyses, the .05 level of significance was adopted as the decision point.

## SUMMARY

The study employed a 3 x 2 Factorial Design with repeated measures. Children identified as high, average or low readers were required to read the same words in isolation and in context.

The test sample was drawn from an Edmonton public School which served a predominantly middle class population. The initial test sample consisted of sixty four grade one children. However, non-



readers and a number of children who spoke English as a second language were eliminated from the sample, leaving a final test sample consisting of forty eight children.

The Gates-MacGinitie Reading Tests, Primary A, Form 1, was administered to the children in each of three classes. The results of this test were used to identify non-readers and to place the students in three reading achievement groups.

Selections from the Standard Reading Inventory and word lists constructed from the selections were administered to each of the children individually by the investigator, and their oral reading miscues were recorded on tape and placed on scoring sheets.

A decision was made to consider the data under three categories: the amount of information used from whole words, the amount of information used from specified positions in words and the amount of featural information used by each child. From these categories, twelve dependent variables were identified. Because the miscue sample for each child differed, all scores were expressed as a ratio of the information used to the total amount of information available in the graphic stimulus.

The statistical treatment of the data included two-way analysis of variance and Newman-Keuls multiple comparison tests of means.



## Chapter 4

### ANALYSIS AND DISCUSSION OF THE DATA

This chapter presents the results of the analysis of the data obtained in the study. Also, the results are discussed and an attempt is made to draw conclusions from the findings about the nature of the reading processes used in beginning reading.

To facilitate the discussion of the data, the amount of graphic information used for word identification is considered within the three general categories described in Chapter 3: the amount of graphic information used from the whole word; the amount of graphic information used from the initial, medial and final positions; and the amount of featural information used in word identification. The amount of featural information used is considered under three subcategories: straight features, curve features and orientation.

#### AMOUNT OF GRAPHIC INFORMATION

##### USED FROM THE WHOLE WORD

In order to investigate the use of graphic information for word identification when the information from the whole word is considered, the following null hypothesis was tested:

- 1.10 There is no significant difference in the amount of graphic information used from the whole word,
- 1.11 by beginning readers for word identification in isolation and in context,



1.12 for word identification by high, average and low beginning readers.

### Graphic Cues Used in Isolation and Context

An examination of Table 1 indicates that there is a significant difference ( $p = .0000009$ ) in the amount of graphic information used by beginning readers for word identification in isolation and in context. Therefore, the null hypothesis 1.11 was rejected.

Figure 2 illustrates the difference in the amount of graphic information used from the whole word in the two conditions of isolation and context. It is apparent that the children used more graphic information in isolation than in context. It is interesting to note that this is true for all three reading achievement groups, and the difference grows progressively greater from low to high groups.

It is likely that the children attended to more graphic information when words were presented in isolation because few other cues were available in this condition. However, the results also seem to indicate that all groups were attempting to use cues from more than just the graphic display when reading words in context.

It is possible that the better performance of the children on words in isolation is at least partially attributable to the methods and materials used in teaching children to read. It is a common teaching procedure to first present words in isolation rather than in context, and there is an abundance of practice materials dealing with words in isolation. Because of these methods and materials emphasizing words in isolation, the children are probably more familiar with words





in this condition. They are therefore more proficient in using graphic information when reading words in isolation.

It seems then, that the additional cues available in context, the abundance of practise materials dealing with words in isolation, and the teaching methods used, may all be factors contributing to the better performance of the children on words in isolation than in context.

#### Graphic Cues Used by Achievement Groups

An examination of Table 1 indicates that there is a significant difference ( $p = .02$ ) in the amount of graphic information used from

TABLE 1

AMOUNT OF INFORMATION USED FROM THE WHOLE WORD  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	71.72	59.49	65.60
Average	67.59	56.50	62.05
Low	62.01	56.79	59.40

Significant Source of Variance:

Groups	$p = .02$
Conditions	$p = .0000009$
Group-Condition Interaction	n.s.



the whole word by the three reading achievement groups. However, results of the Newman-Keuls test indicate that the significant difference exists between the high and low groups only ( $p = .05$ ).

Therefore, the null hypothesis 1.12 was rejected in part. It could not be completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the high and average groups, nor between the average and low groups.

Figure 2 illustrates the nature of the difference between the three reading achievement groups. It is apparent that the high group used the most graphic information, followed by the average group, while the low group used the least graphic information in identifying words. This would seem to indicate that accomplished beginning readers were able to utilize more graphic information from the whole word than were the less able beginning readers.

However, the differences between the groups were mainly attributable to the graphic information used from whole words in

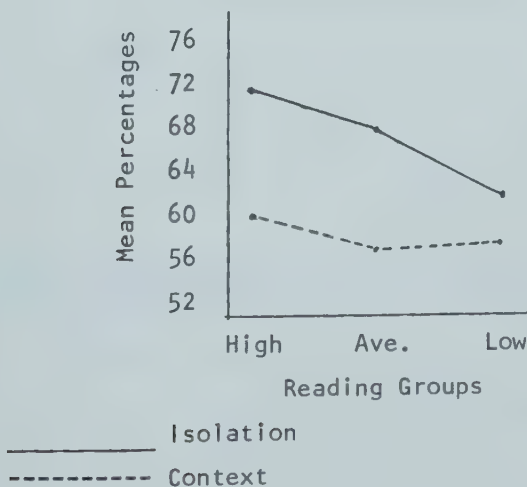


Figure 2

Amount of Information Used from the Whole Word



isolation. There were only minor differences in the amount of graphic information used by the three reading groups from words in context. It seems then, that when other cues were available in the contextual reading situation, both accomplished and less able readers used them in addition to, or instead of, graphic cues.

#### AMOUNT OF GRAPHIC INFORMATION USED FROM INITIAL, MEDIAL AND FINAL POSITIONS

In order to investigate the use of graphic information for word identification when the information from various positions in the word is considered, the following null hypothesis was tested:

- 2.10 There is no significant difference in the amount of graphic information used,
- 2.11 by beginning readers for word identification in isolation and in context,
- 2.12 for word identification by high, average and low beginning readers,
- from: (a) the initial position in words,
- (b) the medial position in words,
- (c) the final position in words.

#### Comparison of Isolation and Context on Amount of Information Used From Various Positions

The initial, medial and final positions were examined, and for each position, a comparison was made between the amount of graphic information used in isolation and in context.



Initial and final positions. Table 2 indicates that there is a significant difference ( $p = .0000009$ ) in the amount of graphic information used from the initial position by beginning readers for word identification in isolation and in context. Similarly, Table 4 indicates that there is a significant difference ( $p = .0000009$ ) in the amount of graphic information used from the final position for word identification in isolation and context. Therefore, the null hypothesis 2.11 was rejected for the initial and final positions.

Figure 3 indicates that, for initial and final positions, all three reading achievement groups used more graphic information in isolation than in context. These results are consistent with those obtained when the experimental conditions were compared on a measure of the graphic information used from the whole word. As in the previous case, it again seems reasonable to conclude that these results are at least partially due to the additional information available to the readers in the contextual situation, to the abundance of practise materials dealing with words in isolation, and to the methods used in teaching the children to read.

Medial position. Table 3 indicates that there is no significant difference in the amount of graphic information used from the medial position by beginning readers for word identification in isolation and context. Therefore, the null hypothesis 2.11 was not rejected for the medial position.

Figure 3 illustrates that the children used very similar amounts of graphic information from the medial position in isolation and in context. These results may be attributable to the fact that the size





TABLE 2

AMOUNT OF INFORMATION USED FROM THE INITIAL POSITION  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	92.31	76.13	84.22
Average	86.46	68.38	77.42
Low	75.42	65.91	70.67

Significant Source of Variance:

Groups	p = .001
Conditions	p = .0000009
Group-Condition Interaction	n.s.

of the medial position used in this study varied, unlike the initial and final positions which were of a constant size. (A discussion of this problem is presented on pages 54, 55 and 56).

Comparison of Achievement Groups on Amount of Information Used  
From Various Positions

The initial, medial and final positions were examined, and for each position, a comparison was made between the amount of graphic information used by high, average and low readers.



TABLE 3

AMOUNT OF INFORMATION USED FROM THE MEDIAL POSITION  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	21.49	20.69	21.09
Average	28.13	30.92	29.52
Low	23.41	26.75	25.08

Significant Source of Variance:

Groups	$p = .02$
Conditions	n.s.
Group-Condition Interaction	n.s.

#### Initial and Final Positions

Table 2 indicates that there is a significant difference ( $p = .001$ ) in the amount of graphic information used from the initial position by the three reading achievement groups. The results of the Newman-Keuls test indicate that the significant difference exists between the high and low groups only ( $p \leq .05$ ). Therefore, the null hypothesis 2.12(a) was rejected in part. It could not be completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the high and average groups, nor between the average and low groups.

Table 4 indicates that there is a significant difference ( $p = .05$ ) in the amount of graphic information used from the final



TABLE 4

AMOUNT OF INFORMATION USED FROM THE FINAL POSITION  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	48.01	35.87	41.94
Average	41.08	28.41	34.74
Low	43.05	25.66	34.35

Significant Source of Variance:

Groups	$p = .05$
Conditions	$p = .0000009$
Group-Condition Interaction	n.s.

position by the three reading achievement groups. The results of the Newman-Keuls test indicate that the significant difference exists between the high and average groups ( $p \leq .05$ ) as well as between the high and low groups ( $p \leq .05$ ). Therefore, the null hypothesis 2.12(c) was rejected in part. It could not be completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the average and low groups.

Table 2 indicates that, for the initial position, the high group used the most graphic information, the average group less, and the low group used the least graphic information. Table 4 indicates that, for the final position, the high group used the most graphic



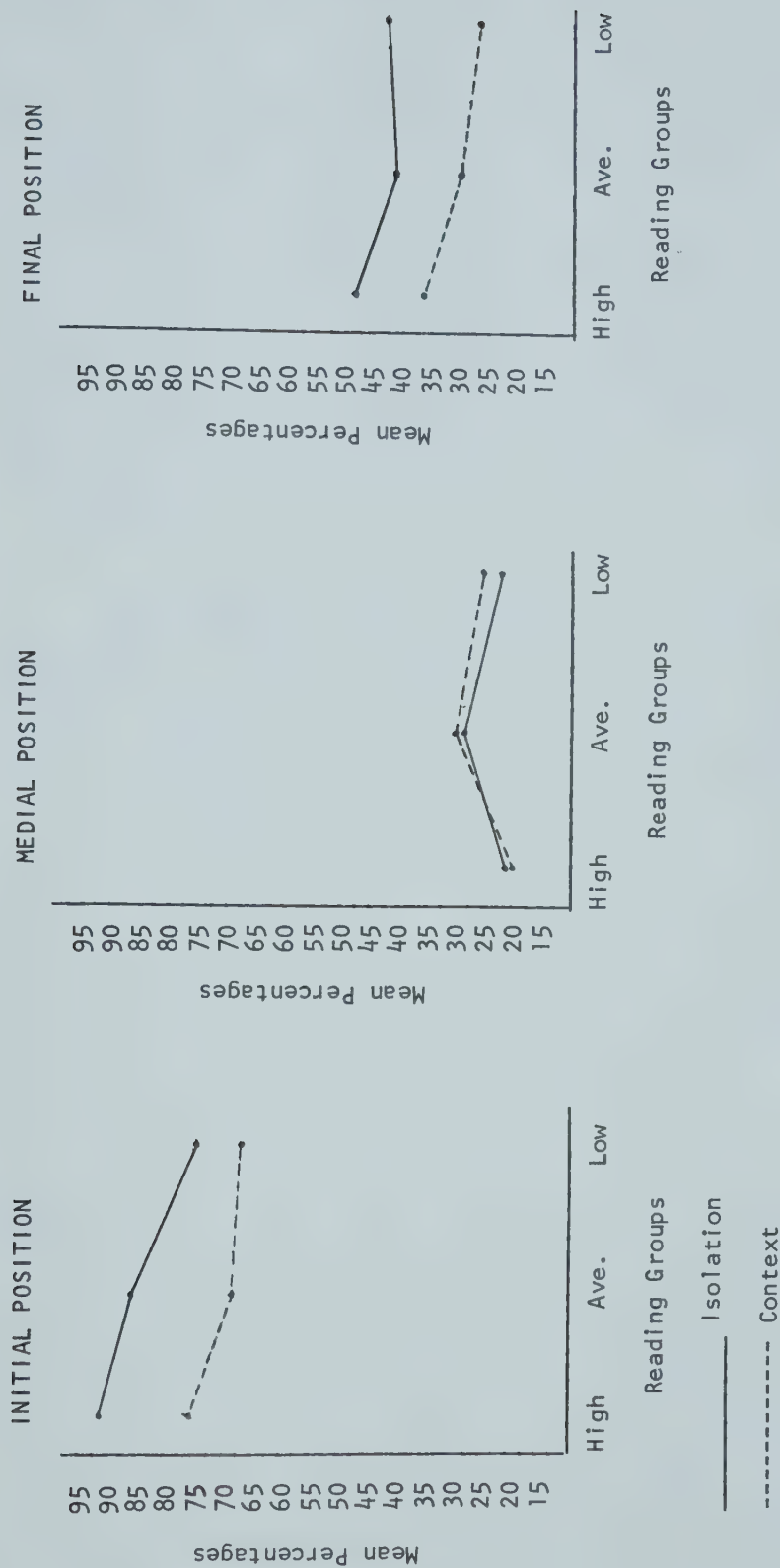


Figure 3  
Amount of Information Used in Various Positions





information, the average group less, and the low group used only slightly less than the average group.

These results seem to indicate that the better beginning readers used more graphic information from the beginnings and endings of words than the less able readers. This finding is consistent with the results obtained when the three reading achievement groups were compared on a measure of the amount of graphic information used from the whole word.

Medial position. Table 2 indicates that there is a significant difference ( $p = .02$ ) in the amount of graphic information used from the medial position by the three reading achievement groups. The results of the Newman-Keuls test indicate that the significant difference exists between the high and average groups only ( $p \leq .05$ ). Therefore, the null hypothesis 2.12(b) was rejected in part. It could not be completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the high and low groups, nor between the average and low groups.

The results obtained from the medial position appear to be inconsistent with those obtained from the initial and final positions. From the medial position, the average group used the most graphic information, the low group less, and the high group used the least graphic information in word identification. However, a closer examination of the manner in which the amount of graphic information used from the medial position was measured, suggests that a confounding factor was operating to produce spurious results within the three reading achievement groups.



Specifically, in measuring the amount of graphic information used from the medial position of words, the expected and observed responses were compared and a judgement was made as to whether or not the child had "used" the information. If all of the letters in the medial position of the expected response did not appear in the same order in the observed response, the judgement was made that the child had "not used" the information.

This method of measuring the amount of graphic information used from the medial position confounded the results because the better readers consistently read more difficult material than the less able readers before reaching frustration level. Consequently, the better readers tended to miscue on the longer words contained in the more difficult passages and word lists, while the less able readers tended to miscue on the shorter words of the less difficult passages and word lists. Because the medial position was arbitrarily defined as "everything except the first and last letters of the word," the medial position in the words miscued by the better readers contained, on the average, more letters than the words miscued by the less able readers. For example, the more able reader might miscue on a word such as "flower" in which the medial position contains four letters, while the less able reader might miscue on a word such as "cow" in which the medial position contains only one letter. It seems then, that an accomplished reader would have a greater chance of miscuing on the medial position of words than would less able readers.

As a result, the information obtained in this study regarding the medial position does not seem to be a valid indicator of the



graphic cues used from that position. Consequently, any comparison based on these results has little or no validity.

#### Comparison of Graphic Cues Used From Initial and Final Positions

One final comparison of the graphic information used from the various positions is possible. Because the initial and final positions contain the same amount of graphic information (one letter), they may be compared. An examination of Figure 3 suggests that all three reading achievement groups used over twice as much graphic information from the initial position as from the final position. It seems then, that beginning readers, irrespective of their level of achievement, may utilize graphic information from the initial position more effectively.

#### FEATURAL INFORMATION USED IN WORD IDENTIFICATION:

##### STRAIGHT FEATURES

In order to investigate the use of straight featural information for word identification by beginning readers, the following null hypothesis was tested:

3.10 There is no significant difference in the amount of graphic information used,

3.11 by beginning readers for word identification in isolation and in context,

3.12 for word identification by high, average and low beginning readers,

from the following features:

(a) straight horizontal,



- (b) straight vertical,
- (c) straight oblique / (right),
- (d) straight oblique \ (left).

Amount of Straight Featural Information Used in Isolation and  
In Context

The straight horizontal, straight vertical and straight oblique features were examined, and for each straight feature, a comparison was made between the amount of information used in isolation and context.

Straight horizontal and straight vertical features. An examination of Table 5 indicates that there is no significant difference in the amount of straight horizontal featural information used by beginning readers in isolation and in context. Therefore, the null hypothesis 3.11(a) was not rejected. Similarly, Table 6 indicates that there is no significant difference in the amount of straight vertical featural information used by beginning readers in isolation and in context. Therefore, the null hypothesis 3.11(b) was not rejected.

As is evident in Figure 4, beginning readers tend to use both the straight horizontal and straight vertical features as well in context as they do in isolation.

Although no statistical comparison was made, Figure 4 seems to suggest that the children were able to utilize the straight vertical feature more successfully than the straight horizontal feature in both isolation and context. It could be hypothesized that the straight vertical feature was more easily discriminated by beginning readers than the





straight horizontal feature. This is consistent with the fact that very often the straight vertical feature constitutes parts of letters and words that project above (ascenders) or below (descenders) the line of writing, and as a consequence tend to have more prominence.

Straight oblique features. Table 7 indicates that there is a significant difference ( $p = .000003$ ) in the amount of straight oblique / (right) featural information used by beginning readers in isolation and in context. Therefore, the null hypothesis 3.11(c) was rejected. Similarly, Table 8 indicates that there is a significant difference ( $p = .0001$ ) in the amount of straight oblique \ (left) featural information used by beginning readers in isolation and in context. Therefore, the null hypothesis 3.11(d) was rejected.

Table 7 and 8 indicate that all three reading groups were able to utilize the straight oblique feature more successfully in isolation than in context. If then, there is a difference between the processes involved in word identification in isolation and context, it would seem that the ability to discriminate the straight oblique feature may be one of the factors contributing to the difference.

Comparison of straight features. One final comparison of the amount of straight featural information used in isolation and context is possible. Beginning readers used a significantly greater amount of straight oblique featural information in isolation than in context, but did not use a significantly greater amount of straight horizontal or straight vertical featural information. This is one of the qualitative differences between the graphic cues used for word identification in isolation and in context.



TABLE 5

AMOUNT OF STRAIGHT HORIZONTAL FEATURAL INFORMATION USED  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	71.88	67.54	69.71
Average	67.88	68.54	68.21
Low	71.94	68.27	70.10

Significant Source of Variance:

None

TABLE 6

AMOUNT OF STRAIGHT VERTICAL FEATURAL INFORMATION USED  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	84.07	84.91	84.49
Average	80.94	78.96	79.95
Low	84.28	82.46	83.37

Significant Source of Variance:

Groups	p = .01
Conditions	n.s.
Group-Condition Interaction	n.s.



TABLE 7

AMOUNT OF STRAIGHT OBLIQUE / (RIGHT)

FEATURAL INFORMATION USED

(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	87.42	80.34	83.88
Average	82.42	80.06	81.24
Low	74.54	57.64	66.09

Significant Source of Variance:

Groups	p = .00001
Conditions	p = .000003
Group-Condition Interaction	p = .002

Amount of Straight Featural Information Used by Achievement Groups

The straight horizontal, straight vertical, and straight oblique features were examined, and for each straight feature, a comparison was made between the amount of information used by the high, average and low reading groups.

Straight horizontal feature. Table 5 indicates that there is no significant difference in the amount of straight horizontal featural information used by high, average and low beginning readers. Therefore, the null hypothesis 3.12(a) was not rejected.



TABLE 8  
AMOUNT OF STRAIGHT OBLIQUE \ (LEFT)  
FEATURAL INFORMATION USED  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	89.22	82.22	85.72
Average	86.41	81.94	84.17
Low	82.69	61.37	72.03

Significant Source of Variance:

Groups	$p = .004$
Conditions	$p = .0001$
Group-Condition Interaction	$p = .02$

The lack of significant differences between the reading achievement groups indicated in Table 5 would seem to suggest that all three reading achievement groups use the straight horizontal feature equally well.

Straight vertical feature. Table 6 indicates that there is a significant difference ( $p = .01$ ) in the amount of straight vertical featural information used by high, average and low beginning readers. The results of the Newman-Keuls test indicate that significant differences exist between the high and average groups ( $p \leq .05$ ) as well as between the average and low groups ( $p \leq .05$ ). Therefore, the null





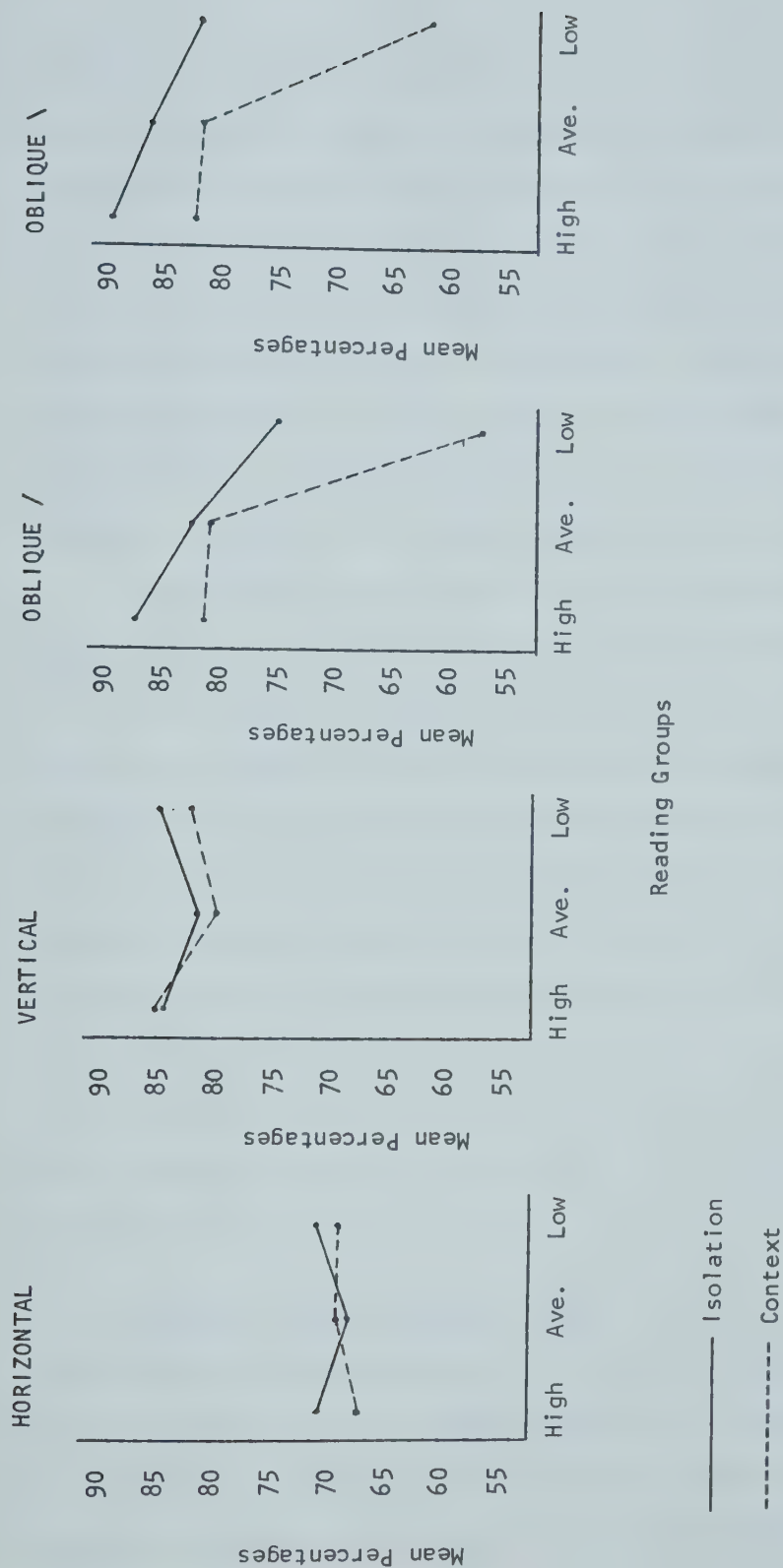


Figure 4  
Amount of Straight Featural Information Used



hypothesis 3.12(b) was rejected in part. It could not be completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the high and low groups.

Table 6 indicates that the average reading group used a significantly lesser amount of straight vertical featural information ( $p = .01$ ) than either the high or low readers. These results suggest that the low readers are relying heavily on the straight vertical feature for word identification because of its relative prominence. Consequently, they use this feature almost as much as the high group.

The average group, however, may be trying to use more complex strategies. It is possible that the average group have learned to use a greater variety of featural information in word identification than the low group. They may have also begun to develop and use their knowledge of the sequences of letters and features within words to reduce the amount of featural information necessary for word identification. Because of these additional strategies, they would not have to rely as heavily on the prominent straight vertical features as would the low group.

The high group might also be using these more complex strategies. However, unlike the average group, they probably use them with more facility.

Straight oblique features. Table 7 indicates that there is a significant difference in the amount of straight oblique / (right) featural information used by high, average and low beginning readers ( $p = .00001$ ). In addition, Table 8 indicates that there is a significant difference in the amount of straight oblique \ (left)



featural information used by high, average and low beginning readers ( $p = .004$ ). The results of the Newman-Keuls test indicate that the significant differences exist between the high and low groups ( $p \leq .05$ ) as well as between the average and low groups ( $p \leq .05$ ) for both the straight oblique / (right) and the straight oblique \ (left) features. Therefore, the null hypotheses 3.12(c) and 3.12(d) were rejected in part. They could not be completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the high and average groups for either type of feature.

For both the straight oblique / (right) and straight oblique \ (left) features, the high readers used the greatest amount, the average readers used less, and the low readers used least. The significant group-condition interaction indicated in Table 7 ( $p = .002$ ) and in Table 8 ( $p = .02$ ) was apparently caused by the particularly small amount of straight oblique featural information used by the low reading group when reading words in context.

It appears then, that accomplished beginning readers attend to a greater amount of straight oblique featural information than do less able beginning readers. This is an indication that the ability to use the straight oblique feature is one of the factors differentiating between high, average and low beginning readers.

Comparison of straight features. One final comparison of the amount of straight featural information used by the reading achievement groups is possible. Both the high and low reading groups used a significantly greater amount of straight vertical featural information than the average reading group. This and the fact that the more



accomplished beginning readers used a significantly greater amount of straight oblique featural information than less able beginning readers, but did not use a significantly greater amount of the straight horizontal feature, is another indication of a qualitative as well as quantitative difference in the graphic cues used by accomplished and less able beginning readers.

#### FEATURAL INFORMATION USED IN WORD IDENTIFICATION:

##### CURVE FEATURES

In order to investigate the use of curve featural information by beginning readers for word identification, the following null hypothesis was tested:

- 4.10 There is no significant difference in the amount of graphic information used,
  - 4.11 by beginning readers for word identification in isolation and in context,
  - 4.12 for word identification by high, average and low beginning readers,
- from the following features:
- (a) closed curve,
  - (b) vertically open curve,
  - (c) horizontally open curve.

#### Amount of Curve Featural Information Used in Isolation and in Context

Tables 9, 10 and 11 indicate that there is no significant difference in the amount of curve featural information used by beginning





readers for word identification in isolation and in context. Therefore, the null hypothesis 4.11 was not rejected for any of the curve features.

It appears, therefore, that beginning readers tend to use the same amount of curve featural information in both isolation and context.

TABLE 9  
AMOUNT OF CLOSED CURVE FEATURAL INFORMATION USED  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	75.96	78.49	77.22
Average	74.42	74.85	74.64
Low	80.59	74.66	77.62

Significant Source of Variance:

None

Comparison of curve features. In making a non-statistical comparison of the data illustrated in Figure 5, it appears that all three reading groups made greater use of closed curve and vertically open curve features than they made of the horizontally open curve feature in both isolation and context. It is possible that the horizontally open curve feature may be more difficult for beginning readers to discriminate than are the closed curve and vertically open



curve features. However, the data from the present study does not lend itself to any definitive statement on this point.

TABLE 10

AMOUNT OF VERTICALLY OPEN CURVE FEATURAL INFORMATION USED  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	78.14	72.44	75.28
Average	78.66	75.69	77.17
Low	73.02	72.43	72.73

Significant Source of Variance:

None

TABLE 11

AMOUNT OF HORIZONTALLY OPEN CURVE FEATURAL INFORMATION USED  
(N=48)

Group	Mean in Isolation	Mean in Context	Average
High	70.56	64.67	67.62
Average	60.33	60.52	60.43
Low	62.02	64.55	63.28

Significant Source of Variance: None



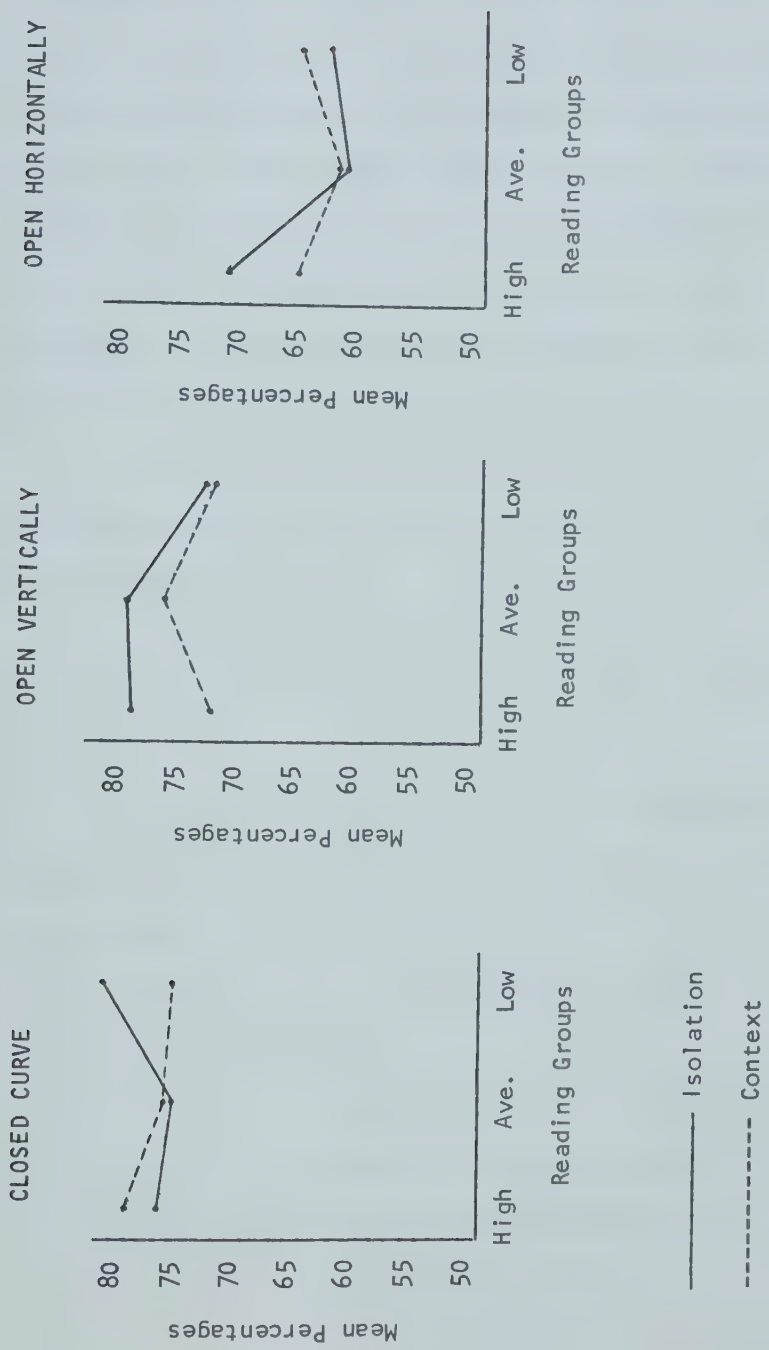


Figure 5  
Amount of Curve Featural Information Used



Amount of Curve Featural Information Used by Achievement Groups

Table 9 indicates that there is no significant difference in the amount of closed curve featural information used by high, average and low reading groups. Table 10 indicates that there is no significant difference in the amount of vertically open curve featural information used by high, average and low reading groups. Table 11 indicates that there is no significant difference in the amount of horizontally open curve featural information used by high, average and low reading groups. Therefore, the null hypothesis 4.12 was not rejected for any of the curve features.

Apparently, the ability to utilize curve features is not one of the processing factors differentiating between accomplished and less able readers.

FEATURAL INFORMATION USED IN WORD IDENTIFICATION:

ORIENTATION

In order to investigate the use of orientation in word identification by beginning readers, the following null hypothesis was tested:

- 5.10 There is no significant difference in the use of orientation,
- 5.11 by beginning readers for word identification in isolation and in context,
- 5.12 for word identification by high, average and low beginning readers.





### Use of Orientation in Isolation and Context

Table 12 indicates that there is a significant difference ( $p = .00006$ ) in the use of orientation by beginning readers for word identification in isolation and context. Therefore, the null hypothesis 5.11 was rejected.

Figure 6 illustrates the fact that all three reading achievement groups are able to utilize orientation to a greater degree when reading words in isolation rather than context. This better performance in isolation is consistent with those results obtained when the experimental conditions were compared utilizing a measure of graphic

TABLE 12

#### VARIABLE 12 - ORIENTATION OF GRAPHIC CUES (N=48)

Group	Mean in Isolation	Mean in Context	Average
High	73.31	69.45	71.38
Average	69.65	64.66	67.16
Low	63.14	52.66	57.90

#### Significant Source of Variance:

Groups	$p = .0008$
Conditions	$p = .00006$
Group-Condition Interaction	n.s.



information from the whole word, from the initial and final positions in the word, and from the straight oblique features.

It seems then, that when other cues were available in the contextual reading situation, beginning readers used them in addition to, or instead of, the orientation of the graphic cues. Therefore, the ability of beginning readers to recognize the orientation of graphic cues is one of the factors differentiating between the identification of words in isolation and in context.

#### Use of Orientation by Achievement Groups

Table 12 indicates that there is a significant difference ( $p = .0008$ ) in the use of orientation by high, average and low beginning readers. The results of the Newman-Keuls test indicate that significant differences exist between the high and low groups ( $p \leq .05$ ) as well as between the average and low groups ( $p \leq .05$ ). Therefore, the null hypothesis 5.12 was rejected in part. It could not be

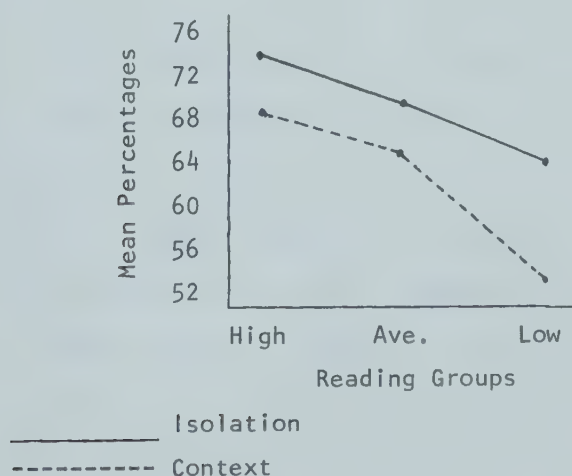


Figure 6

Orientation of Graphic Cues



completely rejected because the results of the Newman-Keuls test did not indicate a significant difference between the high and average groups.

A comparison of the performance of the three reading groups illustrated in Figure 6 reveals that the high group was able to utilize orientation most successfully, the average group was less successful and the low group was least successful in utilizing the orientation of graphic cues for word identification.

These results seem to suggest that the ability to recognize the orientation of graphic cues may be one of the factors differentiating between accomplished and less able beginning readers.

#### SUMMARY

In comparing the use of graphic information by beginning readers for word identification in isolation and in context, it was found that beginning readers used more graphic information in isolation than in context when the amount of information used was measured from the whole word, the initial and final positions in words, both left and right straight oblique features, and orientation. When the amount of information used was measured from the medial position in words, straight horizontal and vertical features, and any of the curve features, the differences between the amount of graphic information used in isolation and context were not significant. In no instance did beginning readers use significantly more graphic information in context than in isolation.



In comparing the use of graphic information for word identification by high, average and low readers, it was found that the high readers used the most graphic information, the average readers used less, and the low readers used the least graphic information when the amount of information used was measured from the whole word, the initial and final positions in the word, both left and right oblique features and orientation. When the amount of information used was measured from the medial position in words, the straight horizontal feature, or any of the curve features, the differences in the amount of graphic information used by the reading groups were not significant. With the exception of the straight vertical feature there were no instances where the relative performances of the reading groups deviated significantly from the pattern described.

It was also found that all reading groups used over twice as much graphic information from the beginnings of words as from the endings.

It was concluded from these results, that there are both quantitative and qualitative differences in the graphic cues used in isolation and context, as well as in the graphic cues used by accomplished and less able beginning readers for word identification.





## Chapter 5

### SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This chapter presents a brief summary of the study and a discussion of the findings and conclusions as they relate to the research previously reported. For purposes of clarity, the findings and conclusions are presented under three main headings: the amount of graphic information used from the whole word; the amount of graphic information used from the initial, medial and final positions; and the amount of featural information used in word identification. The implications of the findings for reading theory and for the teaching of reading are then discussed and suggestions for further research are made.

#### SUMMARY OF THE STUDY

The purpose of the study was to investigate the nature of graphic cues used for word identification by beginning grade one readers. A 3 x 2 Factorial Design with repeated measures was used to compare the amount of graphic information used by high, average and low beginning readers, as well as the amount of graphic information used in isolation and in context.

The test sample of 48 grade one children was drawn from one elementary school serving a population consisting largely of middle class families in the City of Edmonton. The children were identified



as high, average or low readers on the basis of scores on the Gates-MacGinitie Reading Test, Primary A, Form 1 (1965).

The Standard Reading Inventory (1966) was used to obtain a sample of the oral reading miscues of each child when reading words in context. Word lists constructed from the Standard Reading Inventory were used to obtain a sample of the oral reading miscues of each child when reading words in isolation.

To obtain information about the graphic cues used by beginning readers, the data was marked on three dimensions: the amount of graphic information used from the whole word; the amount of graphic information used from the initial, medial and final positions; and the amount of featural information used in word identification. The amount of featural information used was considered under three subcategories: straight features, curve features and orientation. Because the number of words miscued varied from child to child as well as between the two conditions of isolation and context, all data was recorded in terms of percentage scores.

The statistical treatment of the data included a two-way analysis of variance and Newman-Keuls multiple comparison tests of means.

#### MAJOR CONCLUSIONS: AMOUNT OF GRAPHIC INFORMATION USED FROM THE WHOLE WORD

When the amount of graphic information used for word identification was measured from the whole word, there were significant differences between the experimental conditions as well as between the reading groups.



### Graphic Cues Used in Isolation and Context

It was found that beginning readers used more graphic information from the whole word when reading words in isolation than when reading words in context. These results are consistent with those of Singer, Samuels and Spiroff (1974) in their study of first and second grade children. They concluded that the beginning readers used more graphic information when reading words in isolation because there were no other stimuli on the page to misdirect the attention of the children.

In the present study, however, it is concluded that the greater use of graphic information when reading words in isolation is the result of the children using a greater variety of available cues in the contextual reading situation. The abundance of practice materials dealing with words in isolation and the methods used in teaching the children to read, are also probably factors contributing to the greater use of graphic cues when reading words in isolation.

### Graphic Cues Used by Achievement Groups

It was found that the high readers used the most graphic information, the average readers used less and the low readers used the least graphic information from whole words. These results are consistent with those of Weber (1970), who found that beginning readers used more graphic information as they progressed through grade one and that the more able beginning readers used more graphic information than the less able beginning readers.

It appears then, that as beginning readers progress, they do not lessen their dependence on graphic cues in favour of other cue



systems. But rather, at least in the beginning stages of reading, the better readers actually use more graphic information and, as Blemiller (1970) suggests, are likely able to integrate it with additional information from other cues systems.

MAJOR CONCLUSIONS: AMOUNT OF GRAPHIC INFORMATION USED  
FROM INITIAL, MEDIAL AND FINAL POSITIONS

When the amount of graphic information used for word identification was measured from the various positions within the word, there were significant differences between the experimental conditions as well as between the reading groups. However, the results varied depending upon the position in the word from which the information was measured.

Graphic Cues Used in Isolation and Context

The initial, medial and final positions in words were examined, and for each position, a comparison was made between the amount of information used in isolation and context.

Initial and final positions. It was found that, for both the initial and final positions, the beginning readers used more graphic information when reading words in isolation than when reading words in context.

These results are consistent with those obtained when the experimental conditions were compared utilizing a measure of the amount of graphic information from the whole word. It again seems reasonable to conclude that these results are at least partially due





to the children using a greater variety of available cues in the contextual reading situation, to the abundance of practice materials dealing with words in isolation, and to the methods used in teaching the children to read.

Medial position. Because of problems encountered in measuring the amount of information used from the medial positions, it was not possible to make valid comparisons from the results.

#### Graphic Cues Used by Achievement Groups

The initial, medial and final positions in words were examined, and for each position, a comparison was made between the amount of information used by reading achievement groups. In addition, a comparison was made between the amount of graphic information used from the initial and final positions.

Initial and final positions. It was found that the better beginning readers used more graphic information than the less able readers from the beginnings and endings of words. These results are consistent with those obtained when the three reading groups were compared utilizing a measure of the amount of graphic information from the whole word.

Medial position. Because of problems encountered in measuring the amount of information used from the medial position, it was not possible to make valid comparisons from the results.



### Comparison of Graphic Cues Used From Initial and Final Positions

In this study, all three reading groups appeared to use over twice as much graphic information from the initial position as from the final position. This is by no means a surprising finding. Huey (1910) found that children could read discourse from which the second half of words had been eliminated. But when the first half of words was deleted, the text became almost incomprehensible. Bennett (1942) found that children used information from the beginnings of words twice as often as from endings. Also, Marchbanks and Levin (1965) concluded that children used the initial letter more than the final letter, as did Williams, Blumberg and Williams (1970) in their replication of the study. A possible explanation for the greater use of the graphic information from the initial part of the word is suggested by Broerse and Zwaan (1966). From their study, they concluded that the initial part of the word has more information value for the reader than does the final part. And a study by Samuels, Begy and Chen (1975) indicated that children were able to utilize information from the initial position to identify words more accurately than when they used information from the final position.

From the results of the present study and those just cited, it seems possible to conclude that beginning readers are able to use information from the initial position more effectively than from the final position.



MAJOR CONCLUSIONS: STRAIGHT FEATURAL INFORMATION  
USED IN WORD IDENTIFICATION

When the amount of straight featural information used in word identification was measured, there were a number of significant differences between the experimental conditions as well as between the reading achievement groups. However, the results varied depending upon the particular straight feature being measured.

Amount of Straight Featural Information Used in Isolation and in Context

Straight horizontal, straight vertical and straight oblique features were examined, and for each straight feature, a comparison was made between the amount of information used in isolation and context. In addition, the various straight features were compared with one another.

Straight horizontal and straight vertical features. Beginning readers used both the straight horizontal and straight vertical features as well in isolation as in context. It appears that beginning readers attend to each of these straight features equally well in isolation and context.

Straight oblique features. Unlike the straight horizontal and straight vertical features, both the straight oblique / (right) and straight oblique \ (left) features were used significantly more often in isolation than in context. These results are consistent with those obtained when the amount of graphic information used was



measured from the whole word as well as from the initial and final positions.

It appears that the ability to discriminate the straight oblique feature is one of the processing factors differentiating between the identification of words in isolation and in context.

Comparison of straight features. In a final comparison of the amount of straight featural information used in isolation and in context, it was noted that beginning readers used a significantly greater amount of straight oblique featural information in isolation than in context, but did not use a significantly greater amount of straight horizontal or straight vertical information. It was concluded that this indicates a qualitative difference in the graphic cues used for word identification in isolation and context.

#### Amount of Straight Featural Information Used by Achievement Groups

Straight horizontal, straight vertical and straight oblique features were examined, and for each straight feature, a comparison was made between the amount of information used by the three reading achievement groups. In addition, the various straight features were compared with one another.

Straight horizontal feature. All three reading groups were able to use the straight horizontal feature equally well for word identification. It appears then, that the ability to use this





feature is not one of the processing factors differentiating between accomplished and less able beginning readers.

Straight vertical feature. It was found that the average group used a significantly lesser amount of straight vertical featural information than either the high or low groups.

As a possible explanation of this unusual finding, it was suggested that perhaps the low readers were relying heavily on the relatively prominent straight vertical feature and, as a consequence, used it nearly as well as the high group. The average group, however, might be attempting to use more complex strategies and a greater variety of features. Because of these more complex strategies, they would not have to rely as heavily on the prominent straight vertical feature as would the low group. The high group might also be using these more complex strategies, but have probably learned to use them with more facility than the average group.

It should be pointed out that, while the preceeding is somewhat speculative in nature, it does suggest that there is a qualitative difference in the graphic information used by accomplished and less able beginning readers.

Straight oblique features. For both the straight oblique / (right) and straight oblique \ (left) features, the high readers used the greatest amount of information, the average readers used less, and the low readers used the least. This is an indication



that accomplished beginning readers attend to a greater amount of straight oblique featural information than do less able beginning readers.

Comparison of straight features. As previously indicated, the high and low reading groups used a significantly greater amount of straight vertical featural information than the average reading group. This and the fact that the more accomplished beginning readers used a significantly greater amount of straight oblique featural information than less able beginning readers, but did not use a significantly greater amount of the straight horizontal feature, is another indication of a qualitative as well as quantitative difference in the graphic cues used by accomplished and less able beginning readers.

Similar results were obtained in the study by Williams, Blumberg, and Williams (1970). They found that grade one readers tended to use single letter cues, while adults used more visual information and a variety of strategies in word identification. However, their study was a delayed matching-to-sample task in which pseudo-words were presented in isolation only. In a study of children reading actual discourse, Cohen (1975) identified qualitative differences in the graphic information used within the grade one sample. She found that less able beginning readers used mostly first and



last letter cues, while the more accomplished beginning readers were able to be more systematic and learn salient letter combinations.

The present study supports these findings and suggests that the ability to use the straight vertical and straight oblique features is one of the factors involved in the processing differences between accomplished and less able beginning readers.

#### MAJOR CONCLUSIONS: CURVE FEATURAL INFORMATION USED IN WORD IDENTIFICATION

When the amount of curve featural information used in word identification was measured, there were no significant differences between the experimental conditions, nor between the reading achievement groups. It appears then, that beginning readers tend to use the same amount of curve featural information in both isolation and context. Also, it appears that high, average and low beginning readers use similar amounts of curve featural information for word identification.

#### MAJOR CONCLUSIONS: ORIENTATION OF GRAPHIC CUES USED IN WORD IDENTIFICATION

When the use of the orientation of graphic cues in word identification was measured, there were significant differences between the experimental conditions as well as between the reading groups.



### Use of Orientation in Isolation and Context

All three reading achievement groups were able to utilize orientation to a greater degree when reading words in isolation rather than context. This better performance in isolation is consistent with those results obtained when the experimental conditions were compared utilizing a measure of graphic information from the whole word, from the initial and final positions in the word and from the straight oblique features.

It is therefore concluded, that the ability of beginning readers to recognize the orientation of graphic cues is one of the factors differentiating between the identification of words in isolation and in context.

### Use of Orientation by Achievement Groups

The high group was able to use the orientation of graphic cues most successfully, the average group was less successful and the low group was least successful in using the orientation of graphic cues for word identification. A number of studies have produced similar results.

Gibson, Gibson, Pick and Osser (1962) suggest that orientation is a critical factor in reading and that the ability to use it increases with age. In their studies, Popp (1964) and Dunn-Rankin (1968), found that younger children did not fully recognize orientation as a critical factor in reading.





The present study of children reading actual discourse seems to substantiate these findings. The ability to utilize orientation was clearly a factor differentiating between the accomplished and less able beginning readers. It seems apparent that the less able beginning readers were not able to utilize orientation as well as the more accomplished beginning readers.

#### IMPLICATIONS OF THE STUDY

The findings of this study suggest several implications for reading theory and the teaching of reading.

##### Reading Theory

One of the most interesting aspects of the present study is the support that it lends to a "feature-analytic" theory of word identification. While this type of theory has been advanced by Neisser (1967), Gibson (1969) and Smith (1971), very little research evidence has been compiled to test it. A number of studies have been made to assess whether a "feature-analytic" theory of word identification is a viable alternative to the "whole word" and "letter by letter" views of word identification (see e.g., Newman, 1966; Kolars and Katzman, 1966; Lott, Smith and Cronnell, 1968; and Smith, 1969).

The present study, unlike those just cited, attempts to deal with actual "features." Basically, it attempted to investigate



a number of features suggested by other research studies (see e.g., Gibson, Osser, Schiff and Smith, 1963; Popp, 1964; Leton and Shelton, 1968). The results suggested that at least the straight oblique feature, the straight vertical feature and the orientation of graphic cues are used by beginning readers in the internalized processing of the visual stimuli from the printed page.

While the evidence is far from conclusive, the study does suggest that beginning readers may discover and utilize more sophisticated strategies as they learn to identify words more proficiently. It is also possible that some features may be utilized more than others depending on the development of beginning reading strategies. For example, the present study seems to suggest that straight vertical segments are particularly salient (distinctive) features for the less able beginning readers while straight oblique features are used less effectively. The accomplished beginning readers, however, appear to make a great deal more use of oblique features than the less able beginning readers.

Finally, in the "feature-analytic" theory proposed by Smith (1971), he suggests that proficient readers utilize the redundancy available in the reading situation and therefore need less visual information for word identification. However, it would appear that in the process of learning to read, beginning readers must learn to use more featural information in word identification. They may then begin to discover the redundancy that exists in the reading situation



and subsequently reduce the amount of featural information necessary for accurate word identification.

### The Teaching of Reading

Perhaps one of the most significant contributions of this study is the fact that it may begin to give teachers some understanding and appreciation of the complexity of the task facing children in the process of learning to read. This understanding and appreciation is only enhanced by the realization that "word identification" is just one aspect of the total reading process.

However, on a more practical level, the study at least begins to identify some of the features that beginning readers might be taught to discriminate. Further, it begins to identify, in terms of a "feature-analytic" theory, some of the differences between accomplished and less able beginning readers.

One of the most interesting findings of the study is the quite apparent difference in the amount of graphic information used by beginning readers to identify words in isolation and in context. This would seem to indicate that teaching children to identify words in isolation does not necessarily ensure that they will use similar strategies when identifying words in a contextual reading situation. It appears then, that in teaching children to identify words, teachers should provide experiences with the words in both isolation and context.

Finally, miscue analysis was used in this study to obtain information about how beginning readers were processing print. It seems then, that miscue analysis as used herein and as described by



Goodman (1969) could be used by classroom teachers and clinicians to assist them in the diagnostic teaching of reading.

#### LIMITATIONS OF THE FINDINGS

In addition to the limitations identified in Chapter I, a number of limitations became evident as the study progressed.

Since the study was conducted during regular school hours, it was necessary to contend with the normal distractions inherent in the operation of a school (bells, movement in halls, timetable restrictions, etc.). These distractions did tend to affect some of the children. The time in the school day when each child was tested was also a factor. The children tended to be more restless in the afternoon than in the morning.

There was also some difficulty in obtaining an adequate sample of oral reading miscues from the low reading group as they tended to reach "frustration level" in the passages and word lists sooner than the average and high groups.

Of particular significance was the problem of measuring the amount of information used from the medial position of words. This proved to be a somewhat gross measure and as a consequence was not particularly useful in the study.

#### SUGGESTIONS FOR FURTHER RESEARCH

This study utilized a sample of forty eight children from three grade one classes in one school. Consequently, one possible suggestion for further research would be to replicate the study using a larger more heterogeneous cross-sectional sample.





Whereas the present study utilized only grade one children, it might be interesting to do a longitudinal study to see what differences there are in graphic cues used by the children as they progress through the grades. Also, it would be interesting to do a similar study of the graphic cues used by grade one children earlier in the school year.

This study made no distinction between immediate and mediated word identification. It would be possible therefore to isolate and compare these two factors as they affect the graphic information used by beginning readers for word identification. One way of doing this might be to define immediate and mediated word identification in terms of the amount of time needed by each child to identify words.

The initial, medial and final positions used in the present study were quite arbitrarily established. Perhaps they might be redefined in a future study to determine the degree to which the arbitrary nature of these categories affects the information obtained.

Since no comprehension measure was included in this study, it might be desirable to broaden the scope of a future study to include such a measure. This might give some indication of the relationship between the amount and nature of graphic information used by the reader for word identification and his or her comprehension of the material read.



## CONCLUDING STATEMENT

This study used miscue analysis to examine the nature of the graphic information used for word identification by high, average and low beginning readers when they read words in isolation and in context. It was particularly concerned with the amount, position and type of featural information used by these children.

The results suggest that beginning readers use more graphic information for word identification in isolation than in context and that this information may differ in kind as well as amount. The study also suggests that more able beginning readers use more graphic information for word identification than do less able readers.

Finally, the results suggest that the features included in this study are used by beginning readers in the internalized processing of the visual stimuli from the printed page.



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## APPENDIX A

### WORD LISTS CONSTRUCTED FROM THE STANDARD READING INVENTORY





## WORD LISTS

## Preprimer (John)

ball  
is  
big  
it  
a  
John  
said  
see  
I  
looked  
not  
little  
red  
Mother  
and  
blue  
something  
you  
play  
with  
down  
to  
want  
it

## Primer (The Farm)

Mary	birthday
girl	for
Jack	his
boy	
farm	
on	
Father	
live	
They	
There	
the	
animals	
some	
are	
have	
two	
horses	
work	
three	
hens	
cows	
black	
ducks	
dog	
kitten	
likes	
cowboy	
He	
wants	
pony	



## Primer (A Trip)

school  
at  
children  
The  
going  
Mr.  
too  
went  
bus  
barn  
White  
cow  
of  
one  
horse  
can  
go  
ride  
No  
will  
But  
You  
Can

## High Grade one (Bill)

try  
had  
Bill  
outside  
A  
cat  
took  
did  
bring  
in  
Night  
that  
day  
rained  
next  
called  
my  
lost  
Will  
help  
Where  
do  
think  
know  
Let's  
look  
found  
street



## High Grade One (The Store)

ran  
store  
food  
Good  
eggs  
toys  
ice  
wanted  
party  
cookies  
milk  
Mrs.  
Little  
cream  
was  
be  
surprise  
Mary's  
mother  
get  
give  
boys  
girls  
She

## Low Grade Two (A Rabbit)

Joe	heard
garden	running
make	away
he	afraid
father's	so
got	
shovel	
picked	
place	
out	
digging	
started	
planted	
seeds	
grow	
flower	
ground	
In	
care	
watered	
each	
flowers	
up	
weeks	
were	
rabbit	
into	
came	
eating	
saw	
after	
him	



## High Grade Two (Tommy)

One  
 while  
 summer  
 Tommy  
 breakfast  
 chipmunk  
 sat  
 window  
 still  
 jumped  
 Quickly  
 peanuts  
 them  
 put  
 back  
 watched  
 nearer  
 hole  
 drink  
 mouth

## Grade Two (Circus Time)

Bob	pulled
pumpkin	all
working	Green
field	glad
Jack	done
they	gave
pulling	hungry
weeds	hurried
warm	home
very	counted
hard	their
vines	By
cut	As
money	
enough	
circus	
coming	
Saturday	
train	
pull	
station	
would	
early	
morning	
parade	
grounds	
lions	
elephants	
clowns	
everything	
worked	
time	
night	





## Low Grade Three (Night)

bed  
climbed  
pillow  
head  
Slowly  
asleep  
falling  
moon  
through  
trees  
shining  
Suddenly  
moving  
around  
under  
edge  
First  
pounding  
loud  
Then  
somebody  
whistled  
crashed  
felt  
frightened  
blanket  
over  
pretended

## High Grade Three (A Gift)

Henry  
delighted  
When  
parents  
camera  
house  
darted  
immediately  
take  
picture  
soldier  
horseback  
another  
policeman  
traffic  
near  
light  
excited  
interested  
forgot  
lunch  
father  
laughter  
howled  
no  
told  
film  
foolish



## Grade Three (A Trip)

it	tree
Eddie	pine
Frank	rode
airport	hour
visit	about
airplanes	suddenly
land	bump
off	hit
eleven	tumbled
miles	Eddie's
decided	ached
bicycles	leg
packed	serious
sandwiches	tire
way	discovered
but	bicycle
there	flat
many	return
along	riding
signs	turns
road	Frank's
worried	pushing
passed	On
ranch	
cattle	
owl	
an	
sleeping	



## APPENDIX B

### FEATURES OF LETTERS



## FEATURES OF LETTERS

Straight Horizontal	-	e f t z G L T A F H E
Straight Vertical	-	a b d f g h i j k l m n p q r t u J L T B F H E N
Straight Oblique / (right)	-	k r v w x y z A M W
Straight Oblique \ (left)	-	k Q w x y v A M W N
Closed Curve	-	a b d e g o p Q O B
Vertically Open Curve	-	f h g j m n u J
Horizontally Open Curve	-	c e s G S
Orientation	-	b d f g n p q t u W M N





## APPENDIX C

### FRUSTRATION LEVEL AND NUMBER OF MISCUES ON EXPERIMENTAL INSTRUMENTS



I.D.	ISOLATION		CONTEXT	
	Frustration Level	Number of Miscues	Frustration Level	Number of Miscues
Group 3 (Low Group)	1	Primer	Primer	22
	2	Primer	Primer	27
	3	Primer	Primer	24
	4	Beginning One	Primer	16
	5	Primer	Primer	27
	6	High One	High One	26
	7	High One	Primer	18
	8	High One	High One	26
	9	Primer	Primer	63
	10	Beginning Two	Beginning Two	21
	11	Primer	Primer	28
	12	High One	Primer	15
	13	Beginning Two	Beginning Two	20
	14	Primer	Primer	33
	15	High Two	Beginning Two	20
	16	High Two	High Two	33
Average Number of Miscues		22		26



I.D.	ISOLATION		CONTEXT	
	Frustration Level	Number of Miscues	Frustration Level	Number of Miscues
Group 2 (Average Group)	17	High One	High One	29
	18	High One	High One	48
	19	High One	High One	30
	20	Primer	Primer	22
	21	Beginning Two	High One	46
	22	High Two	High One	25
	23	Beginning Two	Beginning Two	36
	24	Beginning Two	High One	27
	25	High Two	Beginning Two	34
	26	Beginning Two	High One	26
	27	Beginning Two	High One	28
	28	Beginning Two	Beginning Two	43
	29	High One	Beginning Two	30
	30	High Two	High Two	30
	31	Two	Beginning Two	25
	32	Beginning Two	Beginning Two	35
Average Number of Miscues		28		32



I.D.	ISOLATION		CONTEXT	
	Frustration Level	Number of Miscues	Frustration Level	Number of Miscues
Group 1 (High Group)	33	Two	High Two	19
	34	High Two	High Two	35
	35	High Two	Beginning Two	26
	36	High Two	Beginning Two	30
	37	High Two	High Two	29
	38	Two	Two	31
	39	High One	Beginning Two	27
	40	Beginning Three	Beginning Three	30
	41	Beginning Two	Beginning Two	36
	42	Beginning Two	Beginning Two	31
	43	Beginning Three	Beginning Three	28
	44	High Three	High Three	27
	45	Two	Two	24
	46	Three	High Three	18
	47	High Three	High Three	30
	48	Three	Three	15
Average Number of Miscues		27		27

















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